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HISTORY OF SCIENCE.—*An establishment was established.*[1] EARL S. JOHNSTON, Division of Radiation and Organisms, Smithsonian Institution. (Communicated by H. A. REHDER.)

One of the penalties attached to the presidency of the Botanical Society of Washington is the retiring address. By tradition this address may be on any subject, and at the end no discussion or questions are permitted, only applause. At first, I was tempted to discuss the place of plant physiology in the botanical world and perhaps dwell to some extent on the physiological work of the Division of Radiation and Organisms at the Smithsonian Institution. Then the thought occurred to me that this year is the 100th anniversary of the establishment of this Institution and that I could never again take advantage of such a wonderful opportunity. Because of the Institution's relationship to the development of science in the United States, a few facts and figures connected with its origin are appropriate at this time.

In September 1835, John Forsyth, then Secretary of State, was surprised to receive a dispatch from London enclosing a copy of the will of a man named James Smithson. An accompanying letter stated that the nephew mentioned in the will had died and that the United States was entitled to his estate. Who was James Smithson and why should he leave his estate of £100,000 to the United States of America? These are fitting questions to be asked on this 100th anniversary of the founding of the Smithsonian Institution.

James Smithson was born in France in 1765, spent most of his life in France and Germany, and in 1829 died in Italy, where he was buried. By the terms of his will most of his property was left to his nephew, Henry James Hungerford. The will stated, "Should the said Henry James Hungerford have a child or children, legitimate or illegitimate, I leave to such child or children . . . the whole of my property. . . . In the case of the death of my said Nephew, without leaving a child or children, or the death of the child or children he may have had under the age of twenty-one years or intestate, I then bequeath the whole of my property . . . to the United States of America, to found at Washington, under the name of the Smithsonian Institution, an Establishment for the increase and diffusion of knowledge among men."

James Smithson was the natural son of Sir Hugh Smithson (later the Duke of Northumberland) and Elizabeth Keate Macie, a widow and lineal descendant of Henry VII. As a youth he bore his mother's name, and it was not until fourteen years after graduating from Pembroke College, Oxford, that he adopted the name James Smithson. It was perhaps a feeling of injustice regarding the circumstances of his birth that created in him the desire to perpetuate his name, for in one of the manuscripts he left we find these words: "The best blood of England flows in my veins; on my father's side I am a Northumberland, on my mother's I am related to Kings, but this avails me not. My name shall live in the memory of man when the titles of the Northumberlands and the Percys are extinct and forgotten."

After graduating from Oxford in 1786, Smithson applied himself to the study of chemistry. He was very skillful in working

[1] Address of the Retiring President of the Botanical Society of Washington, read at the 357th meeting of the Society on December 3, 1946. Received December 20, 1946.

with small quantities of chemicals. Today we might call him a microchemist. "It is said that he was fond of narrating an incident illustrating this faculty. On a certain occasion he happened to observe a lady crying, and hastily taking out a small crystal vessel, he seized the opportunity to catch one of the teardrops in the hope of analyzing it and although half of the precious drop escaped, he succeeded in detecting in the other half not only appreciable amounts of muriate of soda but also the compound of phosphorus known at that time as microcosmic salt, and certain other saline substances."

Smithson was admitted to membership in the Royal Society of London in 1787, less than one year after his graduation from Oxford, one of his sponsors being the famous Henry Cavendish, discoverer of hydrogen. At least 27 of his scientific works were published between 1791 and 1825, all but two relating to chemistry and mineralogy. It may be of interest to botanists to know that one of the two was entitled "An Improved Method of Making Coffee." Another was entitled "On a Substance from the Elm Tree, Called Ulmin"; another, "A Few Facts Relative to the Coloring Matters of Some Vegetables." His writings were well received by his fellow scientists, and he was held in high esteem not only in England but abroad. His publications reflected the influence of his extensive travels in Europe, which gave to them a cosmopolitan flavor. He seemed to realize in his day that science knows no national boundary but is universal for all mankind.

It is interesting to examine in the light of history the complicated chain reaction started by the well-meaning sentiment of a far-sighted Englishman as expressed in his bequest to the United States. Three months after receiving word of this bequest, President Jackson presented the matter to Congress. This, of course, started a pro and con discussion. Senator Calhoun of South Carolina considered it "beneath the dignity of the United States to receive presents of this kind from anyone." Others argued in its favor, and finally the Senate by a 31 to 7 vote decided to prosecute the claim.

The man selected to present this claim in the English Court of Chancery was Richard Rush, the son of Dr. Benjamin Rush, of Pennsylvania. He had been both Comptroller of the Treasury and Secretary of the Treasury, positions that made him particularly well qualified for the work. Dr. Rush, years before, had done all he could to discourage his son from going into Government service but to no avail. He set down in writing his several reasons which in the light of firsthand knowledge of many of us are just as interesting today as they were in 1811:

"1st. The degradation to which such an office exposed a man of literary and professional talents. It was an office that could be filled by any clerk of a bank.

"2nd. The vexations and poverty of political life.

"3rd. His comfortable establishment and excellent prospects in Pennsylvania, the State of his ancestors and family.

"4th. The sickliness of Washington and the insufficiency of the salary to support a growing family.

"5th. The dishonor which he would do to his understanding by such an act.

"6th. My age, also my young family, which required his advice now and would still more require it after my death. I offered to implore him not to accept of the appointment upon my knees, but all, all to no purpose."

On a salary of $3,000 and an allowance of $2,000 Richard Rush secured a bond for $500,000 and set out for England, arriving there the last of August, 1836. The decree adjudging the Smithson bequest to the United States was pronounced on the 9th of May, 1838, in less than two years. In view of the difficulties encountered and the sluggishness of the Court this was quick action. A "moral claim" was entered by the mother of young Hungerford. She urged that the "increase and diffusion of knowledge among men" begin with the education of her children. Mr. Rush settled for £150 a year during her lifetime. Immediately following the publication of the court decree, two men, in no way connected with each other, appeared for claims and were much

surprised to learn that the case was closed and could not be opened.

Mr. Rush had the entire Smithson estate converted into cash and then changed this into gold for transportation to the United States. With the bags of gold safely stored in the hold of the packet *Mediator*, he set out for New York on July 17, 1838. On landing, Mr. Rush received word to deposit the money in the mint at Philadelphia. This he did on September 1 by taking a stage into which he loaded the 105 bags of gold sovereigns. The receipt given to him by the Director of the Mint was for $508,318.46, and I can imagine he breathed a huge sigh of relief.

The Secretary of the Treasury invested the funds in State stocks, mainly in Arkansas, at 6 percent interest. This State having failed to pay its interest in 1846, Congress made good the deficiency and has since paid annually the interest at 6 percent on $538,000, the amount at the time the Arkansas investment was made.

On December 6, 1838, President Van Buren informed Congress that the legacy of Smithson had been received and asked them to proceed toward carrying out the object of the bequest. It took Congress eight years to agree upon a definite plan of organization. Opinions varied greatly as to the best method of increasing and diffusing knowledge among men. Among the ideas put forth were to found:

A great university
An agricultural school and farm
Instruction of females
Courses of lectures
School for the blind

John Quincy Adams, chairman of the House Committee, appointed to handle the matter favored an astronomical observatory. There is no particular reason for a detailed review of the discussions and debates that took place. Each year the President (Van Buren, Harrison, and Polk in succession) urged immediate action. Some benefit, however, was derived from these extended discussions. Congress was enlightened and public opinion molded. Finally a bill establishing the Smithsonian Institution was passed, and on August 10, 1846, it was signed by President James K. Polk. Congress could now resume such matters as the Oregon question and a war with Mexico.

A Board of Regents was soon appointed and the organization of the Institution rapidly took form. Careful consideration was given to the appointment of its first Secretary. Their choice of Joseph Henry, of Princeton, N. J., was most fortunate. Not only was he America's leading scientist but also, as later years proved, a most capable administrator. His program to carry out Smithson's instructions have in general been followed to this day. Congress, then as often in later years was more interested in physical impressions of size, utility, and grandeur. Henry stuck to his convictions, as may be seen from his report, "If physical well-being were alone the object of existence, every avenue of enjoyment should be explored to its utmost extent. But he who loves truth for its own sake, feels that its highest claims are lowered and its moral influence marred by being continually summoned to the bar of immediate and palpable utility."

Secretary Henry realized that the funds at his disposal could easily be exhausted if many projects for the increase of knowledge were undertaken directly by the Institution. His policy of helping others with grants-in-aid and other forms of fostering research far surpassed anything that the Smithsonian could do by itself. Thus a large amount of scientific knowledge was built up in the country in various institutions of learning, and each of these became the center from which new knowledge was diffused. It was Henry's suggestion that the Institution support telegraphic weather data reports, and this work eventually resulted in the establishment of the United States Weather Bureau.

One of Henry's original policies was to establish a system for the "diffusion of knowledge." The International Exchange was established whereby books and documents could be sent duty free to and from other countries through the Smithsonian Institution.

Henry helped to organize the American

Association for the Advancement of Science, and there has always existed a close bond of friendship between it and the Smithsonian Institution. Only this year the Association has moved to its new headquarters after outgrowing its long-occupied home in the Smithsonian Building.

The forerunner of the United States National Museum appears to have been the National Institution for the Promotion of Science, organized in Washington on May 15, 1840. As stated by George Brown Goode, "The establishment of this society was doubtless to a very large degree due to the stimulating and inspiring effects upon public opinion of the Smithson bequest. The germs of the idea which it represented seem, however, to have existed in Washington at a much earlier period, for in 1816, or before, a similar society had been organized in the capital under the name of 'The Columbian Institute for the Promotion of Arts and Sciences'."

For almost 18 years the National Institution was the official custodian of the nation's museum materials and of the collection of Smithson's books, manuscripts, and minerals. Goode further states:

> The influence of the National Institute upon the history of science in the United States, and particularly in educating public opinion and the judgment of Congress to an application of the proper means of disposing of the Smithsonian legacy, can not well be overestimated.
>
> If the Smithsonian had been organized before the National Institute had exerted its influences, it would have been a school, an observatory, or an agricultural experiment station.
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> The formation of a "national museum" was one of the professed objects of Poinsett and his associates in the National Institution, but it does not appear that they ever dignified with that name their collections, which were usually modestly referred to as constituting the "cabinet" of the Institution, both in the constitution and in the proceedings of the society.
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> From 1847 to 1851, however, there was no use made of the term National Museum, the collections of natural history which were accumulating under the care of Professor Baird constituting for the time being the "Museum of the Smithsonian Institution."
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> The National Cabinet of Curiosities (the collection in the Patent Office), carrying with it a certain official atmosphere, as well as an annual appropriation, was, however, one of the parents of the greater establishment yet to come. Of its marriage with the Smithsonian Museum, the National Museum of the United States was the offspring.
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> In 1857, the Smithsonian Institution having definitely accepted the responsibility of caring for the national collections, all the articles deposited with the National Institute were removed.

Among the objects transferred to the Smithsonian Building were James Smithson's valuable collection of several thousand minerals and his books, pamphlets, and manuscripts. Unfortunately, most of these were lost in the fire in the Smithsonian Building of 1865.

To members of the Botanical Society of Washington the best-known collection added to the museum is the U. S. National Herbarium housed in the Smithsonian Building. From a nucleus of plants collected by the Wilkes Exploring Expedition from 1838 to 1842 this collection has grown to nearly two million specimens. Qualified students may avail themselves of the splendid opportunity to study these collections from many parts of the world. I know of no better way of concluding this condensed discussion of the beginnings of the Smithsonian Institution than by referring to the opportunities for research that the National Herbarium offers to botanists.

ARCHEOLOGY.—*A Middle Period cemetery in the Virú Valley, northern Peru.*[1]

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During a major portion of the year 1946, the present author, accompanied by various colleagues of the Institute of Andean Research, conducted archeological investigations in the Virú Valley on the north coast of Peru. Although primarily engaged in a study of prehistoric settlement patterns as they are found in Virú, he was able, in addition, to make a number of minor excavations. The opening of a series of graves in a cemetery, known only by the Virú survey designation as *site V-142*, was one of these subsidiary operations. The graves and their contents are described in this paper.

THE SITE

The Virú River is one of the smaller streams of the Pacific watershed which creates a small oasis valley on its way to the sea. Today its valley is cultivated for a distance of about 30 kilometers from the delta inland and, at its widest point, for about 6 kilometers across the valley. In the upper reaches of the Huacapongo, the principal tributary to the Virú, the modern cultivated strip along the river is no more than a kilometer wide. The lower two-thirds of the valley is bordered, for the most part, by the flat, gradually rising plains of the coastal desert, but in the upper one-third the narrow bottomlands lie between walls of rocky mountainous hills, the lower foothills of the Andean massif.

The cemetery site, *V-142*, is in this upper one-third of the valley, in the Huacapongo branch, on the north side of the river bottom. (Its location is at latitude 8° 22′ 40″ S., longitude 78° 41′ 8″ W.) It is situated on a sloping boulder-strewn alluvial fan that extends down out of a quebrada in the bordering hills. The alluvial deposit is typical of the valley margin in its upper zone. The rare but heavy rains of the coast carry tons of rock and gravel from the hills toward the drainages. *V-142* is on an old section of the fan that has not been washed out or covered by more recent alluvial action. Immediately to the east and west of the cemetery site there are evidences of recent (in terms of human occupation) floodings, which have cut away sections of the old fan, together with portions of the archeological features, probably including the cemetery. Present-day cultivated areas are confined to the actual valley bottom, which lies 200 to 300 meters downslope from the site. It is clear, though, from evidences of ancient irrigation works that in prehistoric times the now abandoned alluvial fans were cultivated. The *V-142* cemetery lies in the midst of archeological communities, canal systems, walls, and mounds.

The surface of the cemetery looks like any other open area on the rocky fan. There are no surface features that can be definitely correlated with the burials. The presence of graves was indicated by old diggings revealing large sherds, human bone fragments, and other evidences around the open grave pits. The site is, incidentally, marked by two surface features not necessarily characterizing it as a cemetery. One of these is a section of an old, partially destroyed defense wall. This wall is made of boulders, is about 1 meter wide, and still stands about a meter or so high. It is probably part of a continuous system of walls that generally run parallel to the valley and were connected with some prehistoric phase of occupation of the alluvial fans. It may either antedate or postdate the burials of the cemetery. The other feature is a small rocky knoll lying just to the south of the wall section. This mound rises between 1 and 2 meters above the surrounding ground level and has dimensions of about 10 by 20 meters; its summit is dotted with old grave excavations. It is probably an artificial construction, quite likely a house or temple mound of a preceding period into which the later interments were made.

In all, the area of the graves at *V-142*, including the mound, can be encompassed within a radius of 35 to 40 meters from a central point on the wall. Graves were located by us on both the north and south sides of the wall.

[1] Received December 10, 1946.

GRAVE EXCAVATIONS

Apparently burials had been made without any plan of arrangement. All graves were merely holes in the rocky soil without special lining, flooring, roofing, or distinctive form. In depth they ranged from about one-half meter to 2 meters. As nearly as could be determined it seemed as though the original grave pit had been roughly circular and relatively narrow (1 meter or less). Twelve graves, in all, were opened in a period of a few days during June.

Grave 1. In dust and boulders at a depth of slightly over 1 meter. No identifiable human skeletal material found.

One globular jar (211-1)[2] was recovered. Height 17.2 cm and diameter 19 cm. Has rounded base and cambered collar with sharp angle. Ware is coarse and mottled gray-black. On the collar are appliqué semicircular nodes, each of which has been impressed with vertically placed incisions. On shoulder, just below collar, are two fillet strips which almost meet at opposite sides of vessel. These strips are also impressed with similar incisions.

Grave 2. Located 1 meter from *Grave 1.* Pottery vessels were first encountered at depth of 85 cm. A few badly disintegrated human bone fragments came from a depth of 1.00 to 1.25 meters. Other vessels were found below this to depth of 1.50 meters. Eight pottery vessels were recovered.

Drum-shaped vessel (213-1) (Fig. 1, j). Height 31 cm, length 33.5 cm, width 21 cm. Has outflared spout or collar. Ends of vessel or drum are flattened but bulging. Body is barrel-like or cylindrical with expanded center. There is a little loop handle parallel to the long axis of the vessel at the base of the collar. Ware is polished black. Pressed design covers one end of barrel. Central element of design is a plain circle to which are attached 8 radiating rays. Four rays are pointed, star-fashion; four others tend to expand toward end. The whole is enclosed in a circle. On opposite end is a frog effigy in relief, affixed to top of vessel facing in toward the collar. Frog lies prone with legs outstretched. Eyes are done with appliqué pellets and back and feet with punctations.

[2] Numbers listed are temporary field catalogue numbers for Institute of Andean Research 1946 season in Peru.

Drum-shaped vessel (213-2). Height 33.5 cm, length 42 cm; width 26 cm. Very similar to 213-1. At base of collar is small rounded ridge. On opposite sides of collar are two tiny nubbins attached to the ridge. No other decoration. Ware polished black.

Plain jar or olla (213-3). Height 29 cm, diameter at midpoint 31 cm. Collar markedly flaring. Rounded base. Polished black.

Plain jar or olla (213-4). Height 21 cm, diameter at midpoint 24.5 cm. Short cambered collar with ridge. Polished black.

Globular jar (213-5). Height 17 cm, diameter at midpoint 17.5 cm. Rounded base, short everted collar. Gray-black, coarse ware. On one side of vessel just below collar are 2 small buttonlike nodes.

Globular bottle (213-6). Height 21.2 cm, diameter 20 cm at midpoint or slightly below. Narrow mouth and long neck. Neck has basal bulge, is constricted at midpoint, and rim is cambered. Gray-black ware with no slip or polish. Appliqué strip encircles shoulder. This strip marked with crisscross incisions.

Globular bottle (213-7). Height 14.7 cm, diameter at midpoint 14.5 cm. Flat circular base, long, slightly outflared spout. Black polished ware. Five evenly spaced nodes project from sides of vessel body.

Stirrup-spout jar (213-8) (Fig. 1, f). Height 24 cm, base 12.7 by 8.1 cm. Lower part of vessel is rectangular box upon which reclines the sculptured figure of a female animal. Unfortunately the head has been broken off. Spout attached to animal's shoulder and hip. Loop of spout is squared in cross section and upper spout is tubular, straight, with thin tapered lip. Small modeled monkey is placed at juncture of spout and loop in classic fashion.

Grave 3. Remains of three human skeletons were found in this grave, in dust and boulders at a depth of 1.00 to 1.20 meters. Associated with an infant were:

Globular jar or olla (428-1). Height and diameter 18.5 cm. Base rounded, collar cambered. Reddish-tan ware without slip.

Small globular jar (428-2). Height 11.5 cm, diameter at midpoint 12 cm. Cambered collar. Gray-black ware with no slip or polish.

Associated with skeletal material unidentifiable as to age or sex was: Globular jar (429). Height 16.5 cm, diameter 18 cm. Slightly flattened base, short, cambered collar with very

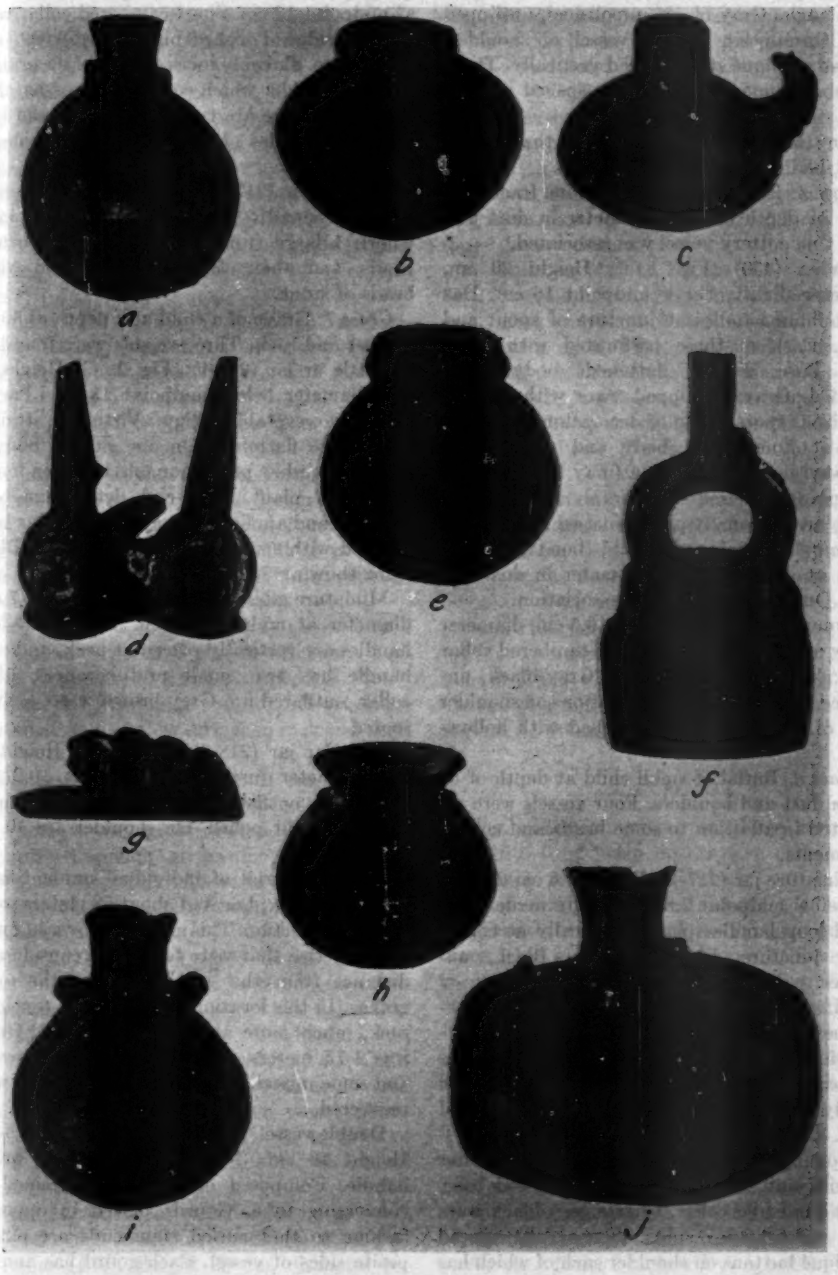

FIG. 1.—Pottery vessels and stone artifact from *V-142* cemetery, Virú Valley, northern Peru: *a*, 219-3, Grave 8; *b*, 219-2, Grave 8; *c*, 218-1, Grave 7; *d*, 219-1, Grave 8; *e*, 220-1, Grave 9; *f*, 213-8, Grave 2; *g*, 437-3, Grave 12; *h*, 218-3, Grave 7; *i*, 430, Grave 4; *j*, 213-1, Grave 2.

sharp angle. Gray-black, unpolished, unslipped ware. On opposite sides of vessel, on shoulder, are two appliqué strips placed vertically. These have been indented with close-spaced impressions.

The third skeleton, probably that of an adult, had no associations.

Grave 4. Remains of a child (bone fragments only) at depth of about 1 meter in dust and rock. One pottery vessel was associated.

Pitcher (430) (Fig. 1, i). Height 20 cm, diameter slightly below midpoint 16 cm. Has two nubbin handles at juncture of spout and body. Each of these perforated with small hole. Base slightly flattened, body angle rounded. Gray, unslipped ware with reddish (oxidized) spots. Band of decoration on bulged area at juncture of body and spout. Fine dentated-incised technique (may be shell-edge stamping). Incised horizontal zone within which are diagonally placed incised lines.

Grave 5. Remains of a child (bone fragments only) at depth of about a meter in dust and rock. One pottery vessel in association.

Globular jar (431). Height 19.5 cm, diameter below midpoint 20.5 cm. Short cambered collar with marked shoulder angle. Gray-black, unslipped ware. Six pellet applications on shoulder each of which has been punched with hollow-reed.

Grave 6. Burial of small child at depth of 50 cm in dust and boulders. Four vessels were associated in addition to some beads and copper ornaments.

Miniature jar (217-1). Height 7.8 cm, diameter below midpoint 7.8 cm. Badly made. Two small loop handles placed vertically at collar-body juncture. Flattened base. Black, unslipped ware.

Miniature jar (217-2). Height 7.5 cm, diameter below midpoint 7.7 cm. Long neck, outflared collar, two small poorly made handles vertically placed on shoulders. Whole vessel poorly made. Black unslipped or unpolished ware. Crisscross incised design on shoulders.

Globular jar (217-3). Height 20 cm, diameter at midpoint 20.5 cm. Slightly flattened base, short cambered collar. Coarse gray-black ware with reddish fire spots. Six evenly spaced appliqué buttons on shoulder each of which has been punched with broad, deep, vertically arranged indentations.

Globular jar (217-4). Height 15 cm, diameter at midpoint 17 cm. Short cambered collar with marked ridge. Polished black ware with soot-caked base. Slovenly incised band of decoration around shoulder which consists of crosshatched elements. There are two vertically placed lugs on opposite sides of vessel within the zone of decoration.

In addition, (217-5), 2 small twisted sheets of copper, 1 small copper bead, 1 copper spindle whorl, 1 large stone bead, 2 conical pottery beads, and about 50 tiny brown and white beads of stone.

Grave 7. Grave of a child at a depth of 80 cm in dust and rock. Three vessels were found.

Bottle or jar (218-1) (Fig. 1, c). Height 12 cm, diameter below midpoint 13 cm. Partial plant or vegetable effigy. Virtually straight neck. Base flattened. On one side of body is curved, stemlike projection, obviously in imitation of a plant. Stem-end detail has been modeled and applied separately. Stem has been covered with small, flat appliqué nodes. Black ware showing some polishing striations.

Miniature globular jar (218-2). Height 7 cm, diameter at midpoint 8 cm. Two small loop handles are vertically placed at neck, and each handle has two small protuberances. High collar, outflared lip. Gray-brown ware, heavily sooted.

Globular jar (218-3) (Fig. 1, h). Height 16 cm, diameter just below midpoint 16.2 cm. Markedly outflared collar. Redware (firing color) without polish. On shoulder are 10 appliqué pellets.

Grave 8. Burial of individual unidentifiable as to age or sex. Located about 58 meters south of the wall section. This grave and *Grave 12* were the only two that were found at a considerable distance from the wall and from the other graves. In this location there is much less loose rock, much more abundant earth soil. Grave was 1.75 meters deep. Three pottery vessels and some miscellaneous copper fragments were recovered.

Double vessel, plant effigy (219-1) (Fig. 1, d). Height 16 cm. Two spouts and flat bridge handle. Composed of two gourds joined by connecting tube. Gourds placed in opposing fashion so that curled stem ends are on opposite sides of vessel. Each gourd has annular pedestal base. Spouts long and tapered. Natural ware color is orange, but this had been covered with white slip and painted black and

red. Red running scroll designs can be vaguely made out despite erosion of surface. Two little modeled birds are perched on the bridge handle.

Globular jar (219-2) (Fig. 1, b). Height 15.7 cm, diameter at shoulder 18 cm. Collar cambered and rounded in profile. High shoulder. Coarse unslipped redware, somewhat blackened by soot. Pressed design on shoulder in band encircling vessel consists of slightly diagonal rows of nodes. These rows may be single, double, or triple. Give vague effect of ears of corn.

Pitcher (219-3) (Fig. 1, a). Height approximately 21 cm, diameter at midpoint 16 cm. Thin, fine sand-tempered ware, buff-red. Appears to have been covered with chalky white slip. Upper half of vessel has, however, been white-slipped in a more solid tone. Horizontal band decoration in red and black on white ground. Black used to outline design and red as filler. Horizontal zone divided into vertical panels. Wavy lines used as fillers in these panels. There are two little nubbin handles on opposite sides of the base of spout.

Two lumps of copper (219-4) about 2 to 4 cm in diameter and 7 mm in thickness. Preserved fragments of string attached.

Grave 9. Fragments of human skeleton located at 50 cm below surface in rock and dust. One vessel associated.

Globular jar (220). Height 21 cm, diameter at midpoint 20 cm. Cambered collar. Coarse gray-black ware heavily sooted. Two horizontally placed appliqué strips on opposite sides of body just below collar. These have been heavily indented with vertically placed impressions or punctations.

Grave 10. Burial of child at depth of 2 meters in dust and amidst large boulders. One vessel associated.

Small globular jar (432). Height 11.2 cm, diameter slightly above midpoint 13 cm. Cambered collar. Redware with soot stains. Pressed decoration in band encircling vessel above shoulder. Design composed of three rows of raised dots enclosed by a single line above and one below.

Grave 11. Burial of child in 60 cm of rocks and dust. One vessel in association.

Pitcher (433). Height 20 cm, diameter between 15 and 13 cm. Vessel slightly flattened in vertical plane. Spout slightly outflared. Slight bulge at collar-body juncture. Gray-black unslipped ware. On shoulders are opposing pairs of nodes. Each node is punctated in center with small round dot.

Grave 12. This grave is located some 60 meters south of the wall, about 2 meters from *Grave 8.* A poorly preserved adult skeleton was found at a depth of 1.50 meters in dust but with little rock. A single vessel, some copper fragments, and a carved stone object were found in association.

Globular jar (437-1). Height 17.5 cm, diameter above midpoint at high, angled shoulder 19 cm. Short cambered collar. Coarse redware caked with soot. There is a small horizontal flange on one side of the rim which has a tiny hollow-reed punctation on its upper side. Pressed zone of decoration above the shoulder angle is a band divided by sets of double vertical lines. There are four panels, each of which contains a field of relief nubbins in three or four horizontal rows.

Two heavy pieces of copper (437-2) which appear to be rough-pounded disks with fragments of string adhering. Diameters 4 and 2.5 cm and thickness about 3 mm.

Stone estolica hook (437-3) (Fig. 1, g). Length 7 cm, width 2.9 cm, thickness 1.7 cm. Carved of a blue-gray stone to represent what appears to be an ear of corn.

DISCUSSION

The *V-142* collection of grave ceramics falls into four main descriptive categories: (1) black ware or gray-black ware; (2) a painted Black-white-red ware; (3) coarse red-fired ware; (4) and a polished orange ware. Out of a total number of 28 vessels there are 13 coarse gray-black, 7 polished black, 5 coarse red, 2 Black-white-red, and 1 polished orange. As a group the collection appears, at first glance, to be representative of the latter part of the Middle Period of the Peruvian north-coast culture sequence. This is the temporal subdivision that Bennett (1939, pp. 140–142, 146–147), with reference to the entire Virú-Moche-Chicama sector, has designated as "Middle Moche II, Sub-period C." He characterizes this particular time bracket by a north-coast variant of the widespread Black-white-red geometric ceramic style, numerically high

percentages of black ware, pressed decoration, absence of architectural features in association with graves, well-preserved cloth, and the frequent presence of copper artifacts with burials. As a subperiod he has distinguished it on a grave and site association basis from the Epigonal or Coast Tiahuanaco style, its apparent predecessor. This distinction in the north gains additional support from the chronological split between Epigonal and the Black-white-red geometric on the Peruvian central coast. At the same time, Bennett makes out a conclusive case for placing this "Middle II, Sub-period C" as pre-Late Chimu on the presence of the Black-white-red and the absence of the characteristic Chimu forms in the black ware associated with it.

The cemetery at *V-142* and the collection found there are consistent with this picture of the upper Middle Period. There is little doubt that *V-142* can be grouped with Huaca de la Cruz (Bennett, 1939, pp. 28–51), Taitacantin (Bennett, 1939, pp. 51–53; Kroeber, 1930, p. 79), and Huaca Larga (Bennett, 1939, pp. 51–53), all sites of this subperiod in the Virú Valley. A more detailed examination of the data shows *V-142* vessel forms paralleling closely those from these three sites. The large percentage of olla forms with short collars and bulged, flared, or occasionally angled rims, the presence of globular vessels with constricted necks and nubbin shoulder handles, and the rare occurrences of double-vessels or stirrup-spout vessels are particularly meaningful in this comparison. Rarity or absence of shallow bowls, the absence of tripod legs, and the presence of appliqué nodes as a common decorative element are further similarities between the Huaca Cruz-Taitacantin-Huaca Larga group and *V-142*.

The very few graves and vessels presented here from *V-142* render it impossible to make valid percentage comparisons of the styles represented between this site and Huaca de la Cruz or Taitacantin. There is, though, at *V-142* a suggestion of the proportional relationships among styles or wares that are seen in the Huaca de la Cruz and Taitacantin collections. Black and gray ware has the highest frequency of occurrence; orange or red ware is next highest; and the Black-white-red style appears in the minority percentages of 11, 28, and 7 at Huaca Cruz, Taitacantin, and *V-142*, respectively.

The two most unusual specimens in the *V-142* collection are the double-vessel plant effigy and the modeled stirrup-mouth jar. The first is perhaps less so than the latter. The long, tapered spouts, flat bridge-handle, and annular pedestal bases to the effigy bodies are typical of the Middle to Late Periods of the north coast. These forms are, however, more often found in black ware than in the Black-white-red style as in this case. This hybridization of painting style and form is a clear demonstration of the fusion and contemporaneity of the Black-white-red influence and the plastic tradition of the north expressed in Middle Period black ware. The stirrup-mouth jar is more unusual in this collection in that in form it is nearer the mode of Late Chimu than any other piece recovered from *V-142*. The stirrup part of the spout is characteristically rectangular in cross section; the upright spout is straight-sided; and the lip has the typical thinning. The base of the vessel is rectangular, and the monkey situated at juncture of stirrup arc and spout is the classic Chimu hallmark. Kroeber (1926, p. 23) and others have marked the fact that not all modeled Chimu pottery is black, and this well-finished orange specimen, in spite of its color, could be classified only as Late Chimu. Its presence in the *V-142* context can best be accounted for by assuming it to be a part of the inception of the Chimu stylistic trends that were to dominate Virú after the close of the Middle Period.

It may be, of course, that *Grave 2*, the grave in which the stirrup-spout occurred, dates slightly later than other graves at the site, particularly those which contained the Black-white-red vessels. An examination of the grave lots with this in mind shows an interesting split that might possibly indicate a temporal difference. The other vessels in *Grave 2* show close resemblances to those in *Graves 1, 3, 4, 5, 6, 7, 9, and 11*. Standing apart from all these are *Graves 8, 10, and 12*. *Grave 8* contained both the

Black-white-red pots and one red pressed-decorated vessel; *Graves 10 and 12* yielded the only other 2 red pressed-decorated ollas in the entire collection. There are, then, some grounds for supposing the red pressed-decorated and Black-white-red graves to be slightly earlier than the black ware graves, one of which has a near-typical Chimu stirrup-mouth jar. In the face of the data from Huaca de la Cruz and Taitacantin this slim evidence for a separation is worth only passing consideration. If at all valid its real importance may be to keynote the fact of the transition which was undoubtedly taking place. This transition of ceramic styles, the gradual disappearance of the Black-white-red and the red or oxidized wares and their replacement by the Chimu forms and black or reduced wares, characterized the Virú Valley in the Middle Period.

Consistent with this interpretation has been the surface survey study of ceramics conducted in Virú as a part of the Institute of Andean Research program by James A. Ford. Ford has found the shift from the Black-white-red or upper Middle Period into Late Period Chimu to be one of gradually changing percentage frequencies in pottery styles, not a major ceramic break.

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ZOOLOGY.—*Further notes on the amphipod genus* Corophium *from the east coast of America.*[1]

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Since the publication of my paper *The amphipod genus* Corophium *on the east coast of America* (Proc. Biol. Soc. Washington **47**: 23–32. 1934), additional records have extended the range of several of the species, a new species has been described from Florida, and the female of *C. louisianum* has been discovered. I am giving detailed figures of the species so far recorded from the east coast of America, several of which have not been figured heretofore, and also a description of the female of *C. louisianum.*

In his paper *A review of the amphipod genus* Corophium *with notes on the British species* (Journ. Marine Biol. Assoc. **21** (2): 589–630. 1937), G. I. Crawford has given extensive references to the literature under the respective species. I am, therefore, giving only brief references to the literature of those species common to both Europe and America. I am following Crawford in his convenient division of the genus *Corophium* into three sections. The species of the east coast of America fall into these divisions as follows:

SECTION A: Segments of urosome separate.

1. Antenna 2, segment 4, different in ♂ and ♀ ..... *C. rioplatense*, p. 48
2. Antenna 2, segment 4, alike in ♂ and ♀ ..... *C. volutator*, p. 51

SECTION B: Segments of urosome fused; uropods 1 and 2 inserted in notches in the lateral margins.

1. Antenna 2, segment 4, different in ♂ and ♀ ..... *C. acherusicum*, p. 53
   C. crassicorne, p. 53
   C. tuberculatum, p. 53
   C. insidiosum, p. 53
   C. ellisi, p. 59
   ♂ unknown.... *C. bonellii*, p. 59
2. Antenna 2, segment 4, alike in ♂ and ♀ ..... no species

SECTION C: Segments of urosome fused; uropods 1 and 2 attached ventrally; lateral margins of urosome without notches.

1. Antenna 2, segment 4, different in ♂ and ♀ ..... *C. acutum*, p. 59
   C. lacustre, p. 59
   C. louisianum, p. 63
2. Antenna 2, segment 4, alike in ♂ and ♀ ..... *C. simile*, p. 63

[1] Published by permission of the Secretary of the Smithsonian Institution. Received November 13, 1946.

Corophium rioplatense mbiagi
Fig. 1, *a–j*

Corophium rioplatense Giambiagi, Anal. Mus. Nac. Hist. Nat. Buenos Aires 34: 138, figs. 1–3. 1926.
Corophium rioplatense Shoemaker, Proc. Washington Biol. Soc. 34: 27. 1934.
Corophium rioplatense Crawford, Journ. Marine Biol. Assoc. 21 (2): 605. 1937.

C. rioplatense was described from the Río de la Plata in 1926 and has not been recorded elsewhere. Senora Giambiagi has kindly sent me a mature male and female, cotypes of her species, from which the accompanying figures were drawn.

Male.—Head without rostrum; lateral lobes short and rounding. The eyes of the specimens examined were rather indistinct, but this is probably due to their state of preservation. Antenna 1 reaching almost to the middle of the fifth joint of antenna 2; first joint without proximal spines on inner margin, but with a number of long, forward-curving setae, lower margin with a single forward-pointing distal spine; flagellum consisting of six or seven joints. Antenna 2, fourth joint with lower margin produced distally into a curved tooth above which is a smaller tooth, fifth joint with a small blunt tooth on lower proximal margin, lower margins of fourth and fifth joints and flagellum furnished with tufts of very long setae.

Mandibular palp, first joint not produced distally, but apically rounding with the plumose seta attached somewhat submarginally; second joint longer than the first and bearing the usual plumose seta beside which is a shorter seta. Gnathopod 1, palm evenly convex, without defining angle, armed on inside surface with four or five slender spines and with several longer spines where the palm passes into the lower margin of the joint, entire palm very finely denticulate; seventh joint with inner margin bearing a distal tooth behind which are very fine denticulations. Gnathopod 2, seventh joint bearing two teeth on inner margin.

Uropod 1, peduncle with three stout spines on outer lateral margin followed proximally by a slender spine, and there appears to be a small spine at the distal angle, inner margin with a small distal spine; the lower distal margin of peduncle produced into a long triangular process with rounding apex; outer ramus with four spines on outer margin, and the usual group of distal spines, inner margin without spines; inner ramus bearing the same spination as outer ramus. Uropod 2, peduncle without spines; rami with distal spines and each ramus with a single spine on outer lateral margin, but none on inner margins. Uropod 3, ramus longer than peduncle. Telson wider than long. Length of the male examined about 3 mm from front of head to end of uropods.

Female.—The female differs from the male principally in antenna 2. Antenna 1 reaching to the distal end of the fifth joint of antenna 2; first joint armed with one spine at the proximal end of the inner margin (Giambiagi's figure shows two spines), lower margin bearing a single distal spine as in male; flagellum consisting of about seven joints. Antenna 2, short and stout; fourth joint with lower margin produced distally into a thin angular lobe bearing a distal spine above which are three smaller spines; five spines borne on low protuberances on inner surface of lower margin; and two spines on inner surface, one near the distal edge of joint and the other about the middle; fifth joint with a low triangular protuberance bearing a spine situated near the middle of the lower margin, and a smaller protuberance near the proximal end of lower margin. Head without rostrum; lateral lobes short and rounding. Mandibular palp as in male, but with a single plumose seta at the apex of the second joint Gnathopod 1 as in male, but bearing about seven submarginal spines on inside edge of palm. Gnathopod 2 like that of male. The uropods of the female are partially missing, and the third uropods lack the rami. The first uropod on the right side is present and appears to be uninjured. The peduncle of this uropod bears no spines, but has three long, slender setae on the outer lateral margin, and the lobe or projection at the lower distal end is sharply triangular; the spine-arrangement of the rami is about the same as in the male. In Giambiagi's figure (3, Ur. 3♀) of uropod 3 of the female the ramus is equal in length to the peduncle.

The fifth peraeopods are lacking on both the male and female at my disposal, but, according to Giambiagi's drawing (fig. 3, p. 7), the second joint of this peraeopod, at least in the male, is very narrow and not at all expanded. The female measures about 4 mm from the front of the head to the end of the uropods.

The female here figured has fully developed marsupial plates and appears to be fully mature, but the male is smaller and may not have reached its maximum size.

Corophium species

Dr. Leonard P. Schultz, in 1942, collected a number of specimens of *Corophium* in brackish water in Ciénaga del Guanavana (swamp), 10

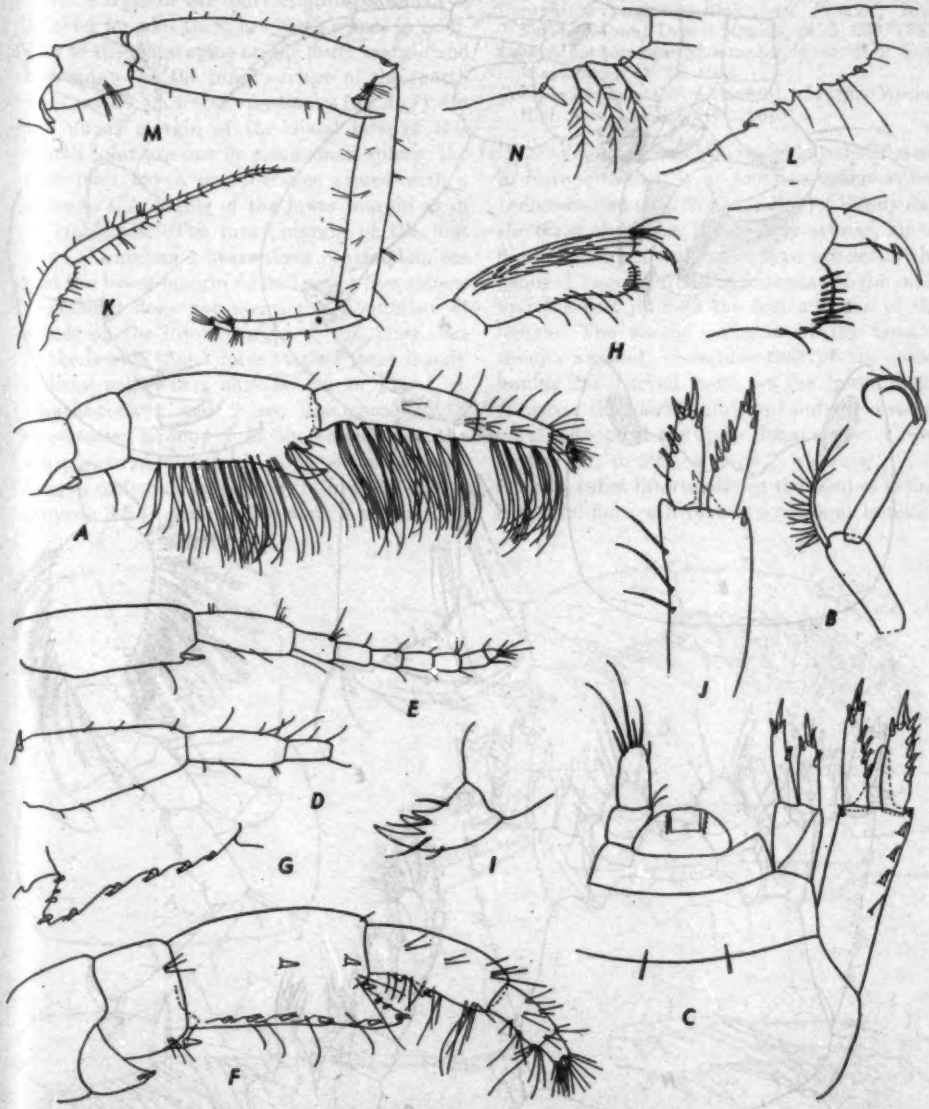


FIG. 1.—*Corophium rioplatense* Giambiagi, male: *a*, antenna 2; *b*, mandibular palp; *c*, urosome and appendages; female: *d*, antenna 1, top view; *e*, antenna 1, side view; *f*, left antenna 2, inside view; *g*, lower margin of fourth joint of antenna 2, tilted to show protuberances and spines; *h*, gnathopod 1; *i*, end of gnathopod 2; *j*, right uropod 1. *Corophium volutator* Pallas, male: *k*, antenna 1; *l*, antenna 1, lower margin or first joint; *m*, left antenna 2, inside view; female: *n*, antenna 1, lower margin of first joint.

km north of Sinnamaica, Venezuela. These specimens were dried out, but after soaking in warm water they show many characters possessed by *C. rioplatense*. Without fresh material from Ciénaga del Guanavana, and a series of *C. rioplatense* showing growth characters, I do not feel justified in identifying this Venezuelan material as *C. rioplatense*.

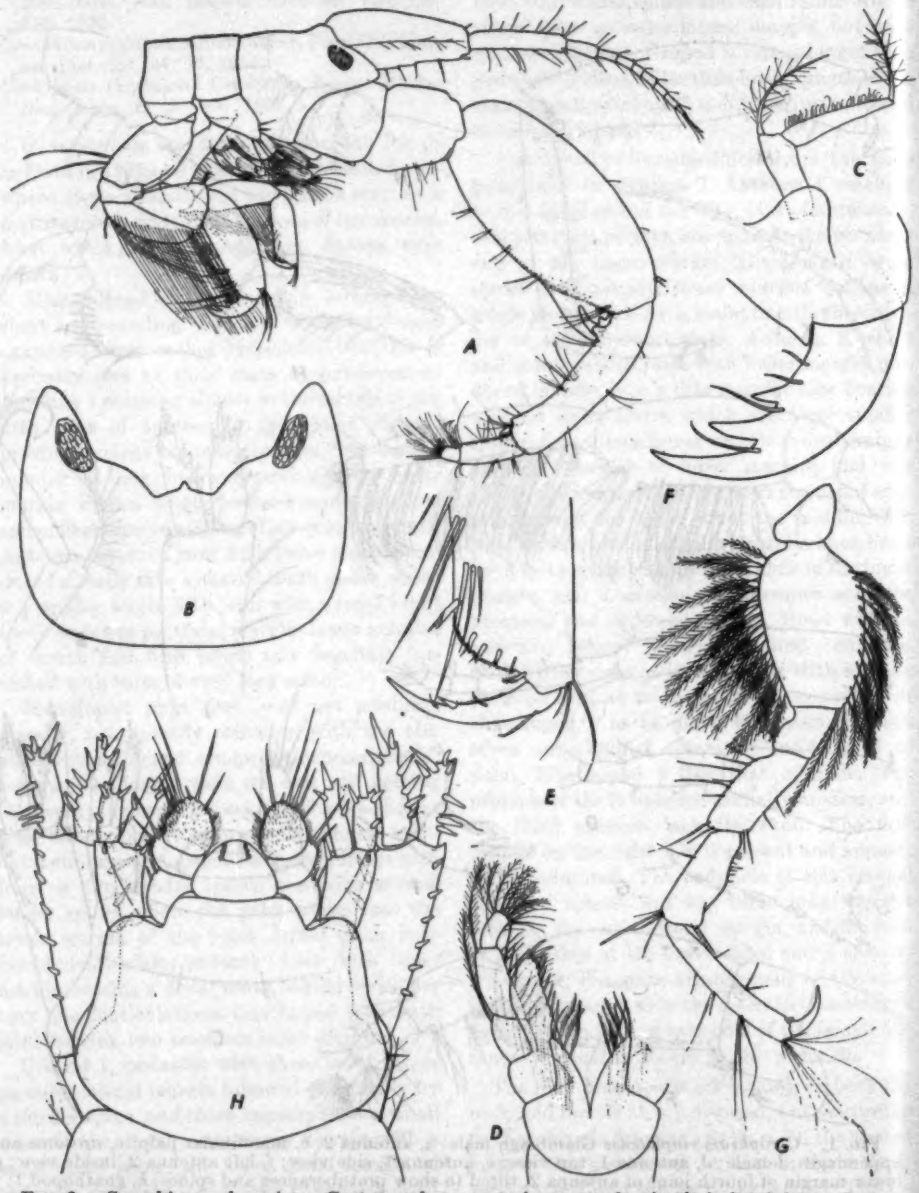


FIG. 2.—*Corophium acherusicum* Costa, male: *a*, anterior part of animal; *b*, head from above; *c*, mandibular palp; *d*, maxilliped; *e*, gnathopod 1; *f*, seventh joint of gnathopod 2; *g* peraeopod 5; *h*, urosome and appendages.

The characters of the male agree with those of the male of *C. rioplatense;* it is without rostrum and uropod 1 possesses the long spatulate distal lobe. In the female young specimens bear four spines beside the distal spine on the lower margin of the fourth joint of antenna 2; in older females there are three spines in addition to the distal spine on the lower margin and two spines on the inner surface of the fourth joint, as shown for *C. rioplatense* (fig. 1, *f*). On the upper margin of the distal lobe of this fourth joint are one or more small spines; the fifth joint has a protuberance armed with a spine in the middle of the lower margin as in *C. rioplatense.* The inner margin of the first joint of antenna 1 bears three proximal spines and the lower margin bears four or five spines. Giambiagi does not mention the number of spines on the lower margin of this joint, but in the female that I have studied there is only a distal spine, as I have shown in Fig. 1, *e*. Gnathopods 1 and 2 are like those of *C. rioplatense.* Uropod 1 of the female has the sharply triangular lobe as in *C. rioplatense.* Length of female from front of head to end of uropods 3.5 to 4 mm. The male is smaller.

Corophium volutator (Pallas)

Fig. 1, *k–n*

Oniscus volutator Pallas, Miscellanea Zoologica: 192, pl. 14, fig. 20. 1766.
Corophium grossipes Sars, Crust. Norway 1: 614, pl. 219. 1894.
Corophium volutator Blake, *in* Procter, Biol. Survey Mount Desert Region, pt. 5: 255. 1933.
Corophium volutator Shoemaker, Proc. Biol. Soc. Washington 47: 23. 1934.
Corophium volutator Crawford, Journ. Marine Biol. Assoc. 21 (2): 595. 1937.

C. volutator is much more widely distributed in Europe than it is in America, where it has been recorded only from the Bay of Fundy and the coast of Maine. It is a large species, about 6 mm in length and is the type species of the genus. I have figured the antennae of the male and the first joint of the first antenna of the female. The second antenna of the female, though smaller, resembles that of the male, having the curved tooth at the lower distal corner of the fourth joint, but not the inward-curving tooth at the upper distal corner. Crawford (1937, p. 596) says of *C. volutator,* " . . . forming tubes intertidally in the mud of estuarine mud-flats, salt-marsh pools, and brackish

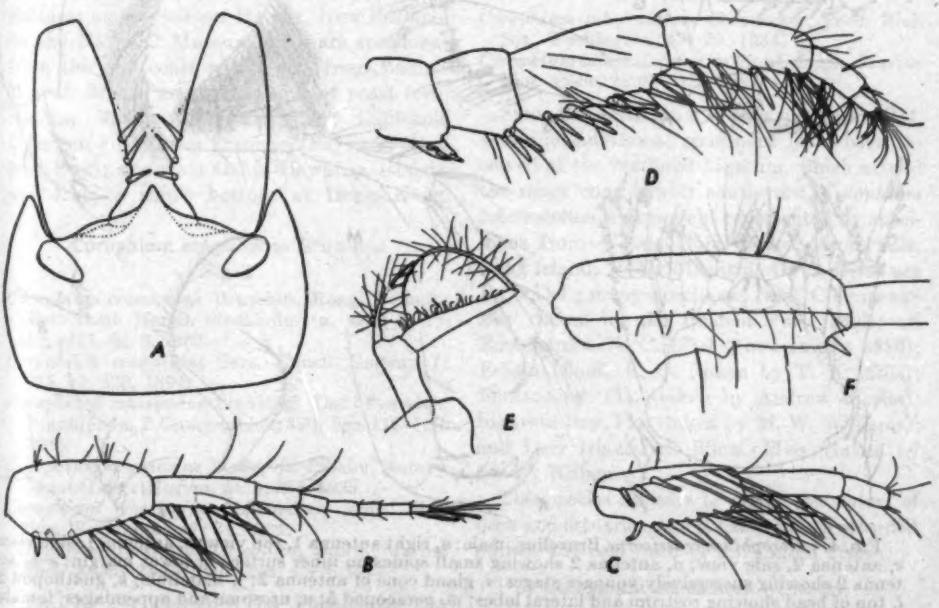


FIG. 3.—*Corophium acherusicum* Costa, female: *a*, head and first antennae from above; *b*, left antenna 1 from above; *c*, left antenna 1 showing spines on lower margin; *d*, left antenna 2; *e*, mandibular palp; male: *f*, left antenna 1 showing spine and protuberances on lower margin.

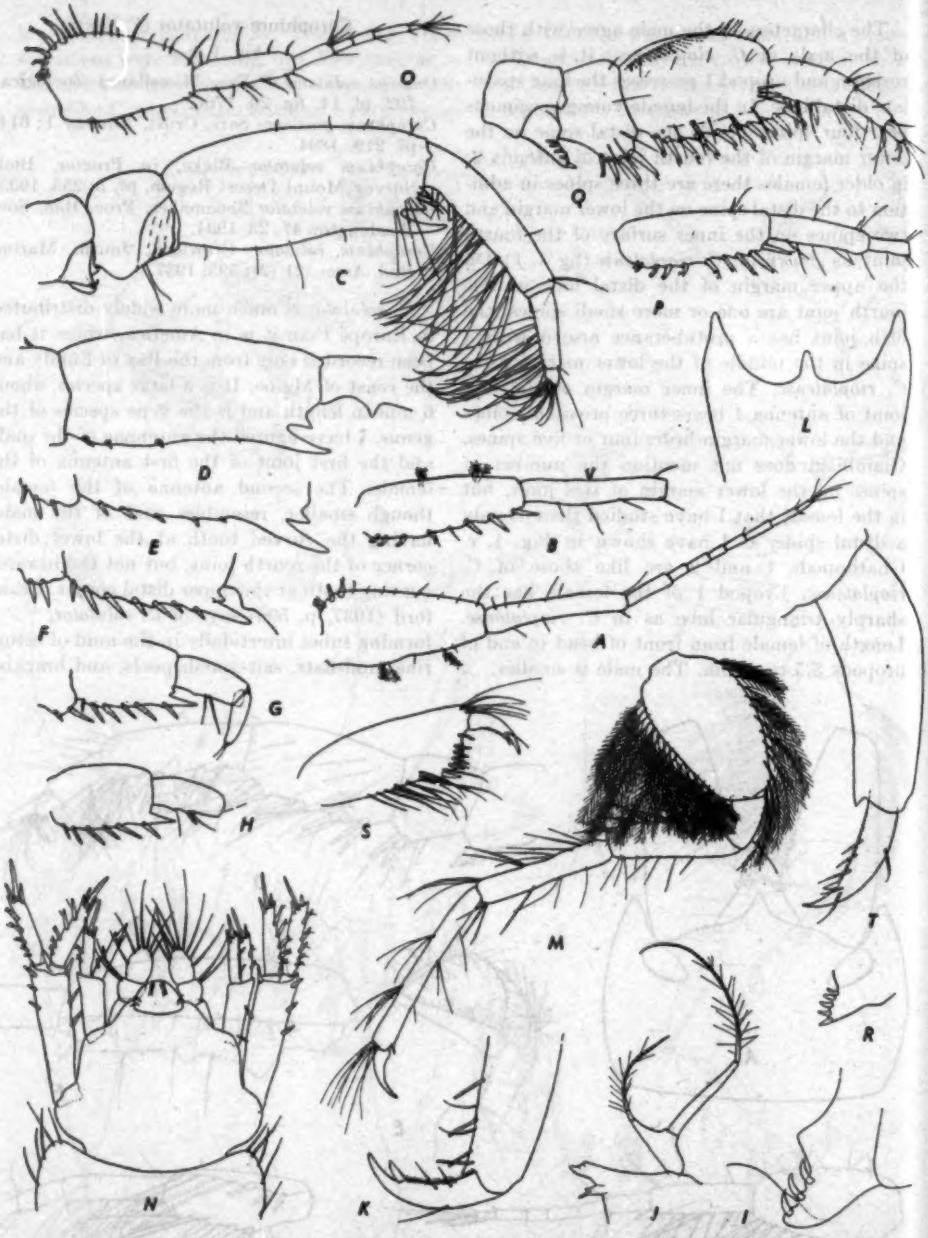


FIG. 4.—*Corophium crassicorne* Bruzelius, male: *a*, right antenna 1, top view; *b*, antenna 1, side view; *c*, antenna 2, side view; *d*, antenna 2 showing small spines on inner surface of lower margin; *e–h*, antenna 2 showing successively younger stages; *i*, gland cone of antenna 2; *j*, mandible; *k*, gnathopod 2; *l*, top of head showing rostrum and lateral lobes; *m*, peraeopod 5; *n*, urosome and appendages; female: *o*, right antenna 1, top view; *p*, antenna 1, side view; *q*, antenna 2, side view; *r*, gland cone, inside view; *s*, gnathopod 1; *t*, gnathopod 2.

ditches. In some of the streams running into the Tamar it lives in almost fresh water associated with a number of insect larvae. In many of its localities, however, the water is nearly of full salinity." The specimens here figured were taken in the Shubenacadie River at Urbania, Nova Scotia, by the Biological Board of Canada.

Corophium acherusicum Costa

Figs. 2, 3

Corophium acherusicum Costa, Mem. Accad. Sci. Napoli 1: 232. 1857.
Corophium acherusicum Shoemaker, Proc. Biol. Soc. Washington 47: 24. 1934.
Corophium acherusicum Crawford, Journ. Marine Biol. Assoc. 21 (2): 617, fig. 2, P. 1937.

Specimens in the national collection which were formerly identified as *Corophium cylindricum* Say have proved to be the same species as *C. acherusicum* Costa, which has a wide distribution both in the Eastern and Western Hemispheres.

Crawford gives as the distribution: Southern England; coasts of France and Holland; Mediterranean; northern coast of Africa from the Suez Canal to Senegal; Durban Bay; Dar-es-Salaam; and Lyttleton Harbor, New Zealand. In the National Museum there are specimens from the east coast of America from Baffin's Bay to Brazil; and from the west coast from Alaska, Vancouver Island, and California (Monterey Bay, San Francisco Bay, and Newport Bay); also from Oahu, Hawaiian Islands, and from a ship's bottom at Hong Kong.

Corophium crassicorne Bruzelius

Fig. 4

Corophium crassicorne Bruzelius, Kongl. Svenska Vet.-Akad. Handl. Stockholm (n. ser.) 3 (1): 15, pl. 1, fig. 2. 1859.
Corophium crassicorne Sars, Crust. Norway 1: 615, pl. 220. 1894.
Corophium crassicorne Stebbing, Das Tierreich, Amphipoda. I Gammaridea: 690, figs. 116–118. 1906.
Corophium crassicorne Blake, *in* Procter, Survey Mount Desert Region, pt. 5: 255. 1933.
Corophium crassicorne Shoemaker, Proc. Biol. Soc. Washington 47: 24. 1934.
Corophium crassicorne Crawford, Journ. Marine Biol. Assoc. 21 (2): 607, figs. 4 a–f. 1937.

Dr. K. Stephensen (*The Tanaidacea and Amphipoda of the Arctic*, Fauna Arctica, 1932, p. 372) gives as the distribution of this species, "From southern Spitzbergen and Barents Sea to Black Sea; Jan Mayen (not Greenland and Iceland)." In 1933 Blake recorded it from Mount Desert Island, Maine. In 1934 I extended the range on the east coast of North America from Bay of Fundy to Gardiners Bay, Long Island, New York. Two fully developed females collected by Dr. Wm. H. Dall at Chichagof Harbor, Attu, Alaska, June 20, 1873, are undoubtedly this species. I can find no published records of the extension of the range of *C. crassicorne* since 1934. A. O. Walker in 1904 recorded the species from Ceylon. Dr. Chas. Chilton in 1921 recorded it from Chilka Lake and New Zealand, and said that he also had specimens from Port Jackson, New South Wales. In 1925 Dr. Chilton recorded it from Talé Sap, India. It is now thought that these specimens recorded by Walker and Chilton should be referred to *C. triaenonyx* described by T. R. R. Stebbing in 1904 from Ceylon (Spolia Zeylanica 2, pt. 5; 25, pl. 6a), as this species has several characters resembling those of *C. crassicorne*.

Corophium tuberculatum Shoemaker

Fig. 5

Corophium tuberculatum Shoemaker, Proc. Biol. Soc. Washington, 47: 29. 1934.
Corophium tuberculatum Crawford, Journ. Marine Biol. Assoc. 21 (2): 623. 1937.

Since the description of this species in 1934, very fine additional specimens have been received at the National Museum, which extend the range considerably southward. *Corophium tuberculatum* is at present represented by specimens from Woods Hole, Mass.; Amityville, Long Island, N. Y.; Mispitton Cove, Delaware Bay, Del.; many specimens from Chesapeake Bay, taken by the steamer *Fish Hawk;* off Bogue Inlet, N. C. (*Fish Hawk* station 8286); Edisto Island, S. C. (taken by T. K. *Ellis*); Fernandina, Fla. (taken by Andrew Pizzini); Sarasota Bay, Fla. (taken by M. W. Williams); and Deer Island, off Biloxi, Miss. (taken by M. W. Williams).

This species appears to prefer the waters of bays and estuaries, and it has not been recorded outside the east coast of the United States.

Corophium insidiosum Crawford

Figs. 6, 7

Corophium insidiosum Crawford, Journ. Marine Biol. Assoc. 21 (2): 615. fig. 2 a–g. 1937.

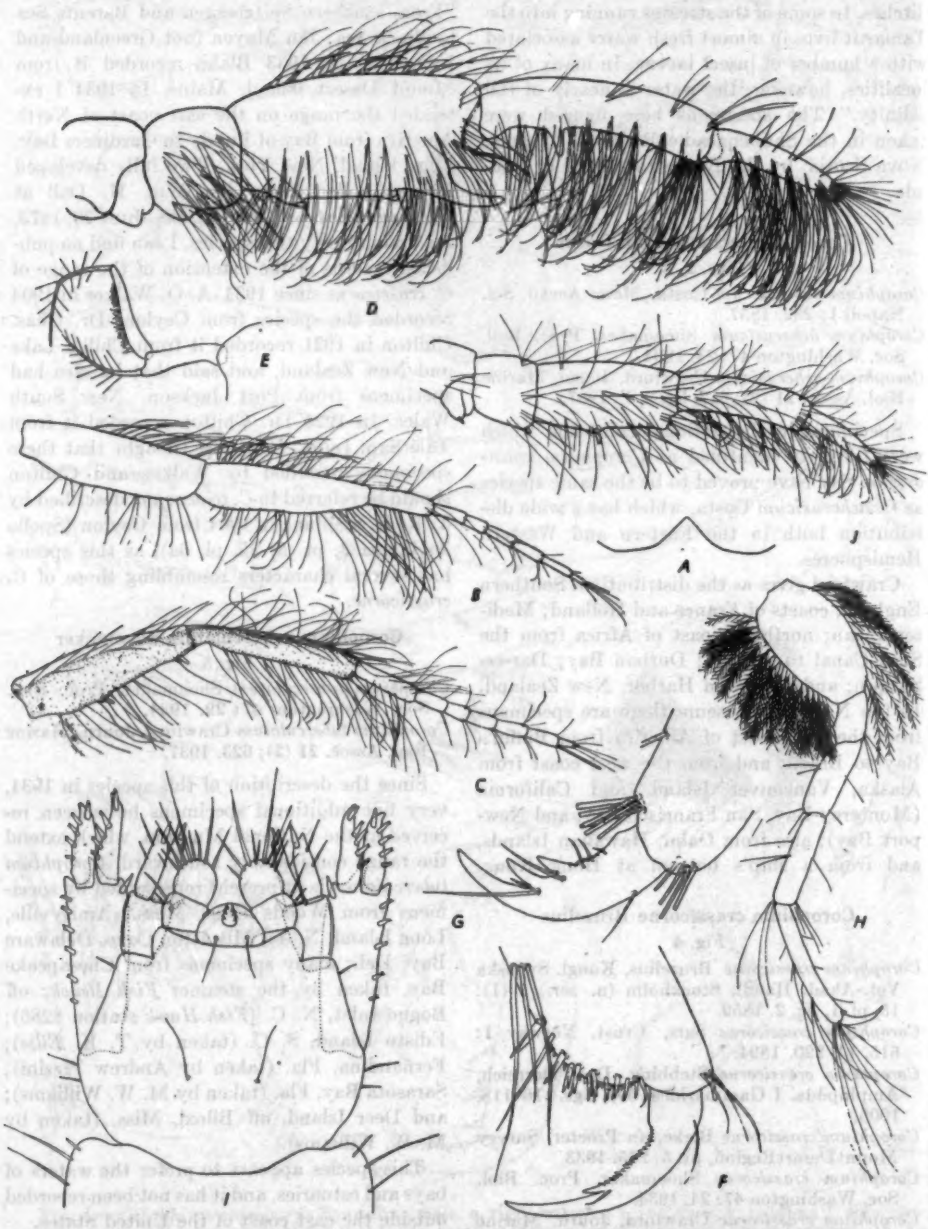


FIG. 5.—*Corophium tuberculatum* Shoemaker, male: *a*, rostrum, like that of female; *b*, antenna 1 from above; *c*, antenna 1, side view; *d*, antenna 2; *e*, mandibular palp; *f*, gnathopod 1; *g*, gnathopod 2; *h*, peraeopod 5; *i*, urosome and appendages; female: *j*, antenna 2.

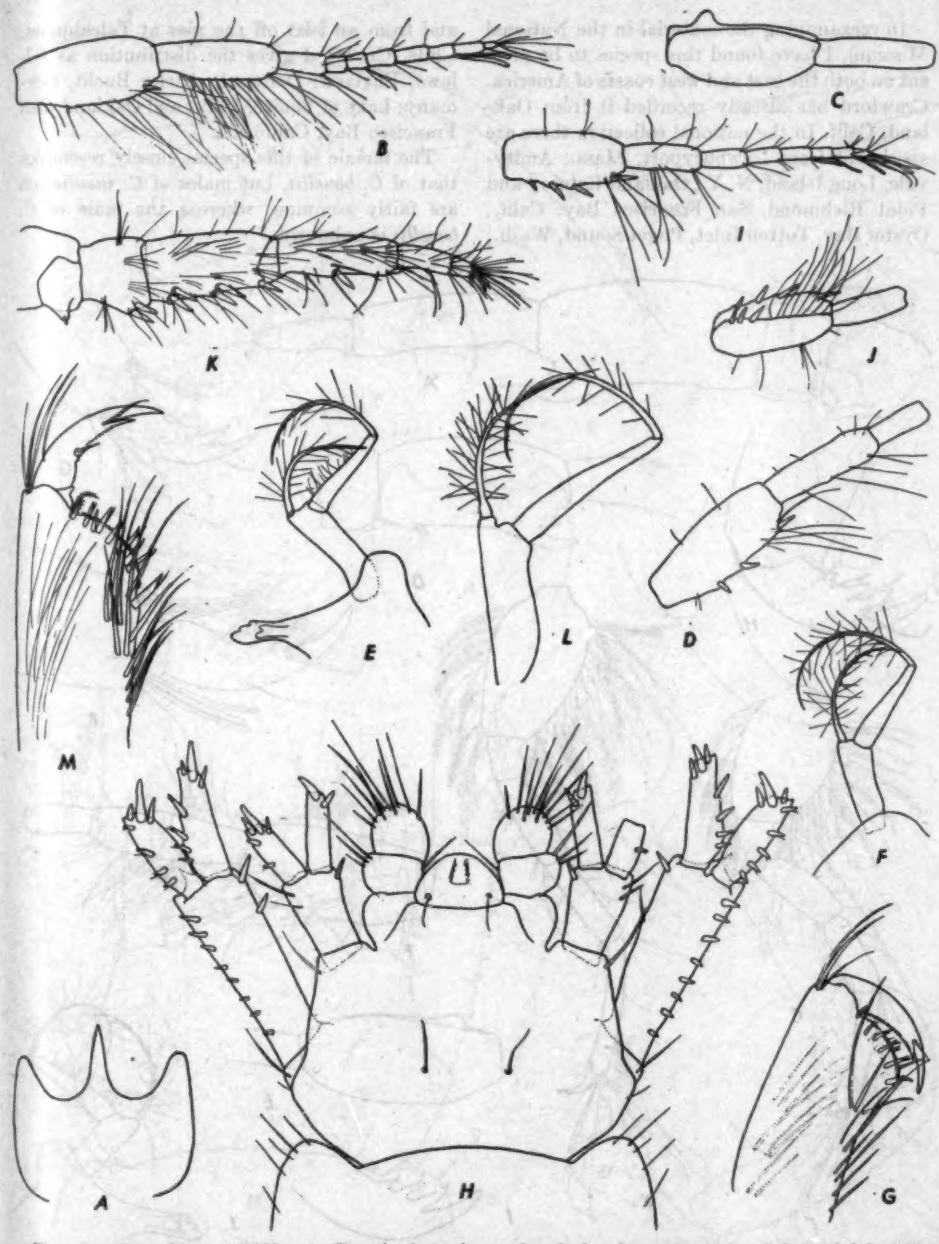


FIG. 6.—*Corophium insidiosum* Crawford, male: *a*, head showing rostrum and lateral lobes; *b*, antenna 1, side view; *c*, right antenna 1 from above, showing inner lobe; *d*, antenna 1 of young male, side view showing spines on lower margin; *e*, mandible; *f*, mandibular palp of a male from Chile; *g*, gnathopod 1; *h*, urosome and appendages; female: *i*, antenna 1, side view; *j*, antenna 1, top view showing the proximal spine of inner margin and the spines of lower margin; *k*, antenna 2; *l*, mandibular palp; *m*, gnathopod 1.

In reexamining the material in the National Museum, I have found this species to be present on both the east and west coasts of America. Crawford has already recorded it from Oakland, Calif. In the national collection there are specimens from Newburyport, Mass.; Amityville, Long Island, N. Y.; Oakland Estuary and Point Richmond, San Francisco Bay, Calif.; Oyster Bay, Totten Inlet, Puget Sound, Wash.; and from an islet off the pier at Talcahuana, Chile. Crawford gives the distribution as follows: England; Denmark; Kieler Bucht, Germany; Lake of Venice, Italy; and Oakland, San Francisco Bay, California.

The female of this species closely resembles that of *C. bonellii*, but males of *C. insidiosum* are fairly common, whereas the male of *C. bonellii* is unknown.

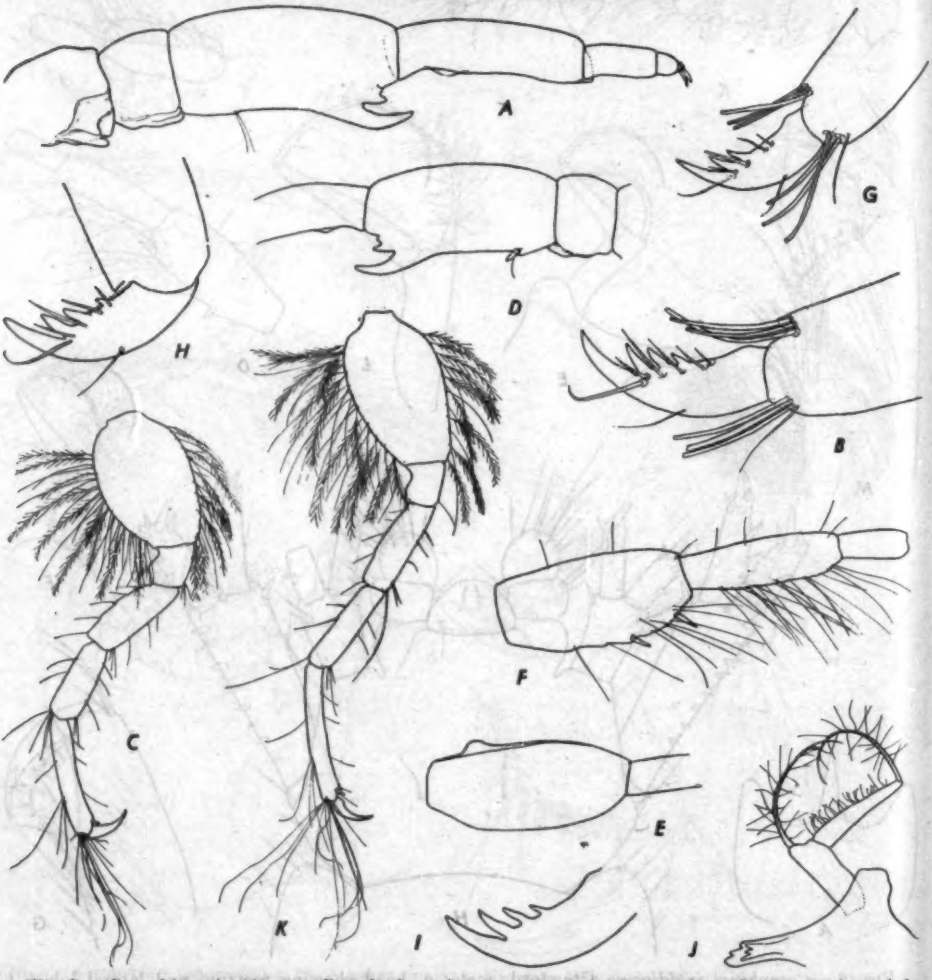


Fig. 7.—*Corophium insidiosum* Crawford, male: *a*, antenna 2 of mature male; *b*, gnathopod 2; *c*, peraeopod 5; *d*, antenna 2 of young male showing a proximal spine on lower margin of fourth joint; *e*, *f*, top and side views of antenna 1 of young male; *g*, gnathopod 2 of a young male; female: *h*, gnathopod 2; *i*, seventh joint of gnathopod 2 of a female from Chile; *j*, mandible of a female from Chile; *k*, peraeopod 5.

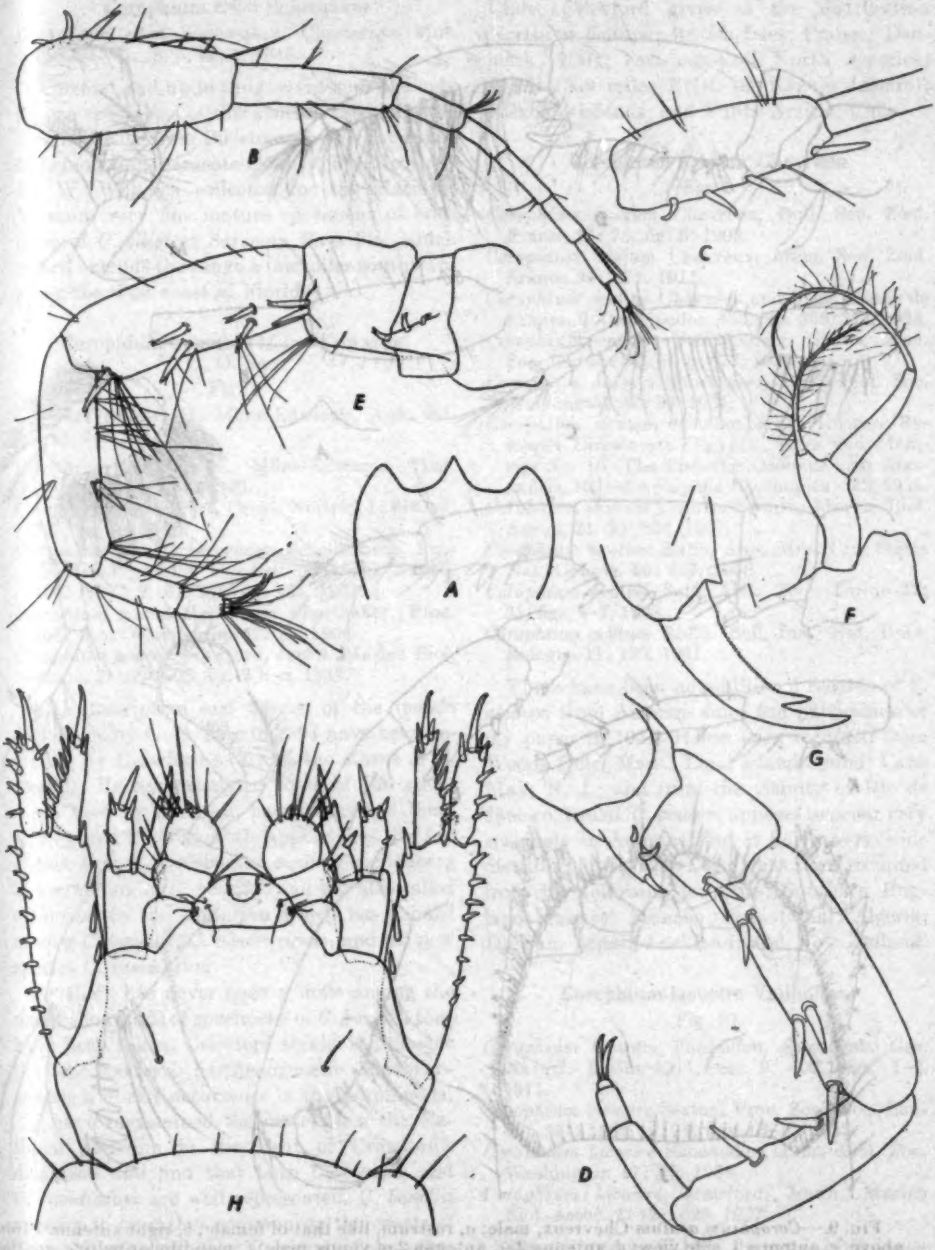


FIG. 8.—*Corophium bonellii* Sars, female: *a*, top of head showing rostrum and lateral lobes; *b*, right antenna 1, top view; *c*, antenna 1, side view showing spines on lower border; *d*, antenna 2; *e*, antenna 2 with only one spine on fifth joint; *f*, mandibular palp; *g*, gnathopod 2; *h*, urosome and appendages.

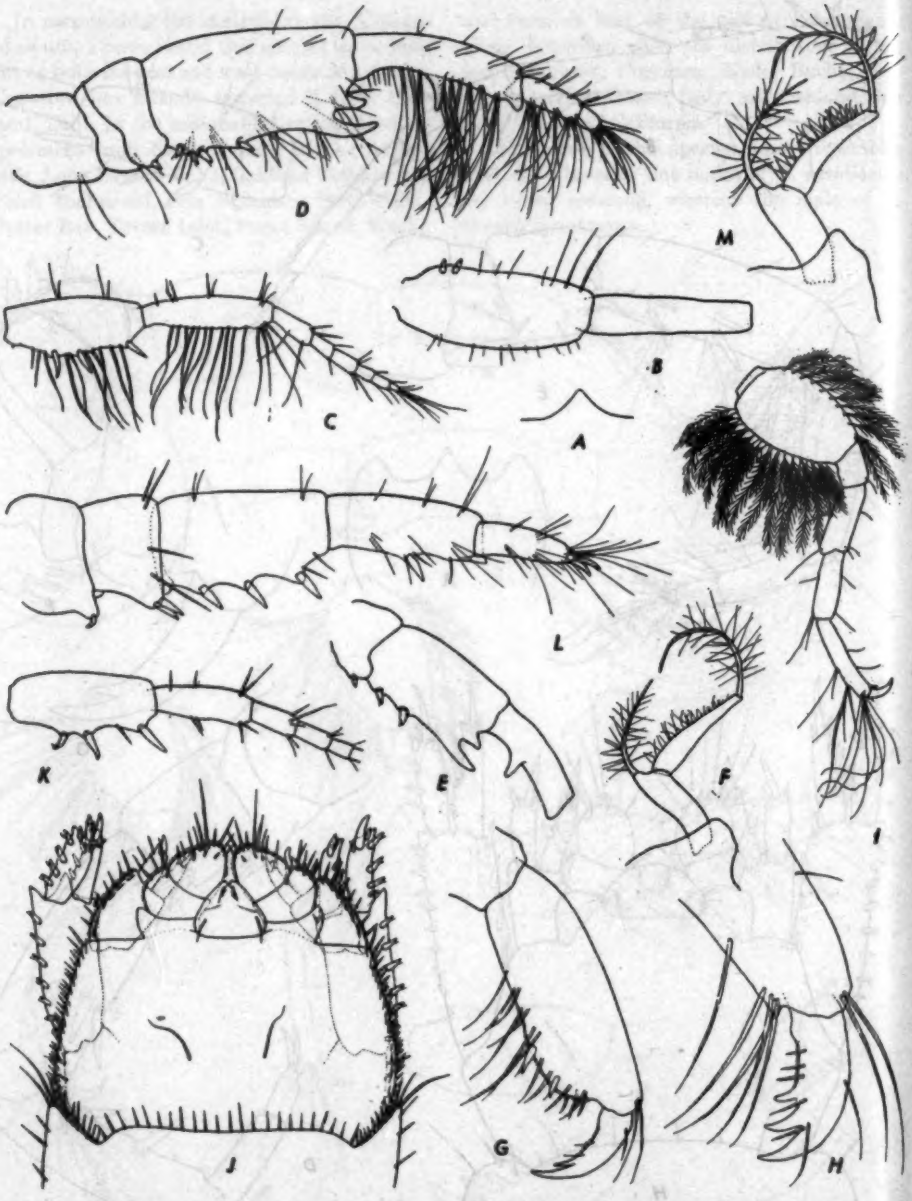


FIG. 9.—*Corophium acutum* Chevreux, male: *a*, rostrum, like that of female; *b*, right antenna 1 from above; *c*, antenna 1, side view; *d*, antenna 2; *e*, antenna 2 of young male; *f*, mandibular palp; *g*, gnathopod 1; *h*, gnathopod 2; *i*, peraeopod 5; *j*, urosome and appendages; female: *k*, antenna 1, side view (the inner margin of first joint bears two proximal spines as in male); *l*, antenna 2; *m*, mandibular palp.

Corophium ellisi Shoemaker

Corophium ellisi Shoemaker, Charleston Mus. Leaflet No. 18: 3, fig. 1. 1943.

The first and up to the present time the only known specimens of this species were collected by T. K. Ellis from the stomach of a ray taken in Lemon Bay, Sarasota County, Fla. Recently M. W. Williams collected for the National Museum very fine mature specimens of both sexes of *C. ellisi* at Sarasota Bay, Fla., which record extends the range a few miles southward along the west coast of Florida.

Corophium bonellii (Milne-Edwards) G. O. Sars

Fig. 8

Corophia bonellii H. Milne-Edwards, Ann. Sci. Nat. 20: 385. 1830.

Corophium bonellii H. Milne-Edwards, Hist. Nat. Crust. 3: 67. 1840.

Corophium bonelli Sars, Crust. Norway 1: 616, pl. 221, fig. 1. 1894.

Corophium pseudacherusicum Schellenberg, Further zool. results, Swedish Antarctic Exped. 1901–1903, 2 (6): 258, fig. 134. 1931.

Corophium pseudacherusicum Shoemaker, Proc. Biol. Soc. Washington 47: 25. 1934.

Corophium bonelli Crawford, Journ. Marine Biol. Assoc. 21 (2): 608, fig. 2 h–o. 1937.

The description and figures of the female specimens by G. O. Sars in 1894 have been accepted by Crawford as fixing the status of *C. bonellii*. He has examined some of the specimens used by Sars and has redescribed them and figured the diagnostic appendages. He has shown that *C. pseudacherusicum* Schellenberg is a synonym of *C. bonellii*, and has also called attention to the confusion which has existed among *C. bonellii*, *C. acherusicum*, and his new species *C. insidiosum*.

As there has never been a male among the many thousands of specimens of *C. bonellii* that have been taken, Crawford thinks it probable that the species is parthenogenetic. Parthenogenesis is of rare occurrence in the Amphipoda.

I have reexamined the material in the National Museum in the light of Crawford's diagnoses and find that both *C. bonellii* and *C. insidiosum* are well represented. *C. bonellii* appears to be rather common on the coasts of Nova Scotia and New England. Proceeding southward, there are no further records in the Museum until the Falkland Islands are reached. There are also specimens from Punta Arenas, Chile. Crawford gives as the distribution Northern Europe; British Isles; France; Denmark; Italy; east coast of North America; Brazil (500 miles ENE. of Rio de Janeiro); Falkland Islands; and Punta Arenas, Chile.

Corophium acutum Chevreux

Fig. 9

Corophium acutum Chevreux, Bull. Soc. Zool. France 33: 75, fig. 6. 1908.

Corophium acutum Chevreux, Mem. Soc. Zool. France 23: 271. 1911.

Corophium acutum Chevreux and Fage, Faune de France, 9 Amphipodes: 366, figs. 359, 374. 1925.

Corophium acutum Schellenberg, Trans. Zool. Soc. London 22, pt. 5: 672. 1928.

Corophium acutum Shoemaker, Proc. Biol. Soc. Washington 47: 26. 1934.

Corophium acutum Schellenberg, Fisheries Research Directorate (Egypt). Notes and Memoirs No. 18 (The Fisheries Grounds near Alexandria. 10.—Amphipoda Benthonica): 22. 1936.

Corophium acutum Crawford Journ. Marine Biol. Assoc., 21 (2): 624. 1937.

Corophium acutum Ruffo, Ann. Mus. Civ. Storia Nat. Genova 60: 147. 1938.

Corophium acutum Salfi, Arch. Zool. Torino 27: 31, figs. 4–7. 1938.

Corophium acutum Ruffo, Boll. Inst. Ent. Univ. Bologna 11: 123. 1941.

There have been no additional records of *C. acutum* from America since the publication of my paper in 1934. It has been recorded from Woods Hole, Mass.; Lond Island Sound; Cape May, N. J.; and from the vicinity of Rio de Janeiro, Brazil. *C. acutum* appears to occur very sparingly in America, but it has a very wide distribution elsewhere, as it has been recorded from the following localities: Southern England; France; Monaco; Suez Canal; Algeria; Durban, Natal; Auckland; and New Zealand.

Corophium lacustre Vanhöffen

Fig. 10

Corophium lacustre Vanhöffen, Sitzungsb. Ges. Naturf. Berlin 1911, no. 9: 400, figs. 1–4. 1911.

Corophium lacustre Sexton, Proc. Zool. Soc. London 1912: 664, pl. 74, figs. 13–17. 1912.

Corophium lacustre Shoemaker, Proc. Biol. Soc. Washington 47: 27. 1934.

Corophium lacustre Crawford, Journ. Marine Biol. Assoc. 21 (2): 625. 1937.

Since my paper of 1934 the range of *C. lacustre* has been extended both northward and southward along the east coast of the United States. In 1934 the range extended from Chesa-

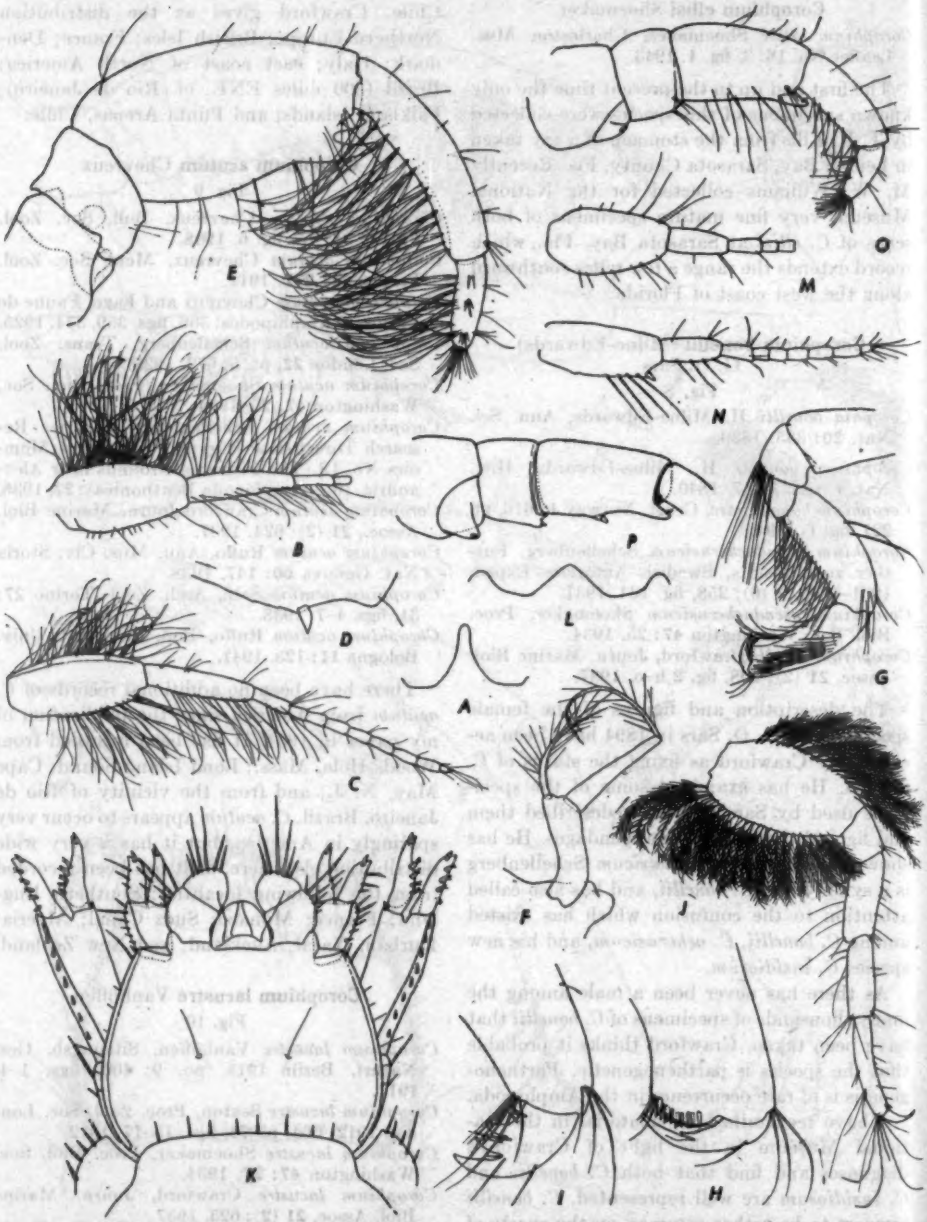


FIG. 10.—*Corophium lacustre* Vanhöffen, male: *a*, rostrum; *b*, right antenna 1 from above; *c*, antenna 1, side view; *d*, lower margin of first joint of antenna 1; *e*, antenna 2; *f*, mandibular palp; *g*, *h*, gnathopod 1; *i*, gnathopod 2; *j*, peraeopod 5; *k*, urosome and appendages; female: *l*, rostrum; *m*, right antenna 1 from above; *n*, antenna 1, side view; *o*, *p*, antenna 2.

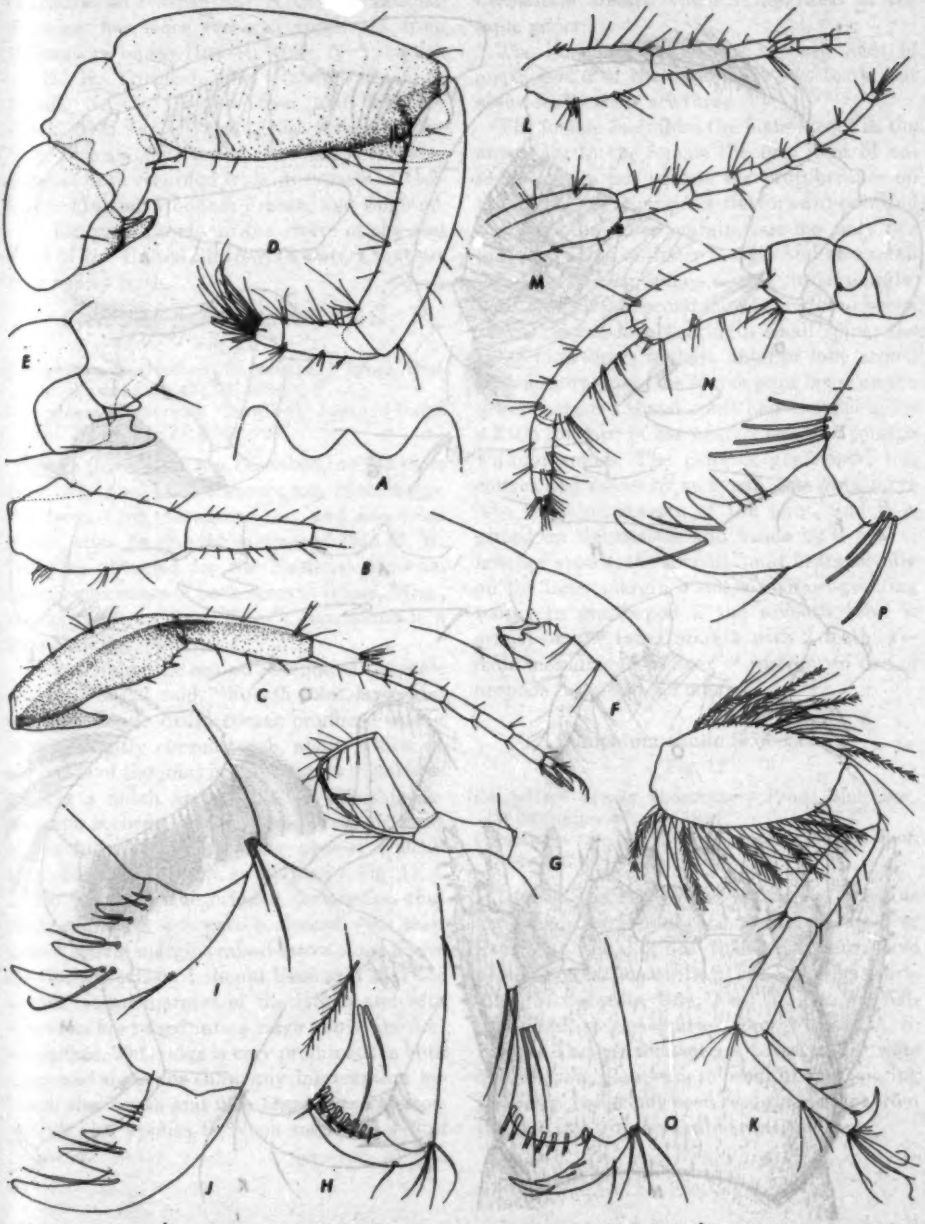


FIG. 11.—*Corophium louisianum* Shoemaker, male: *a*, rostrum and eye lobes; *b*, right antenna 1 from above; *c*, antenna 1, side view; *d*, antenna 2; *e*, second joint of antenna 2 showing gland-cone; *f*, fourth joint of antenna 2 showing small accessory distal tooth; *g*, mandibular palp; *h*, gnathopod 1; *i*, seventh joint of gnathopod 2 of type showing the three teeth on inner margin; *j*, seventh joint of gnathopod 2 showing two teeth on inner margin; *k*, peraeopod 5; female: *l*, right antenna 1 from above; *m*, right antenna 1, side view; *n*, antenna 2 showing spines on inner surface of fourth joint; *o*, gnathopod 1; *p*, seventh joint of gnathopod 2.

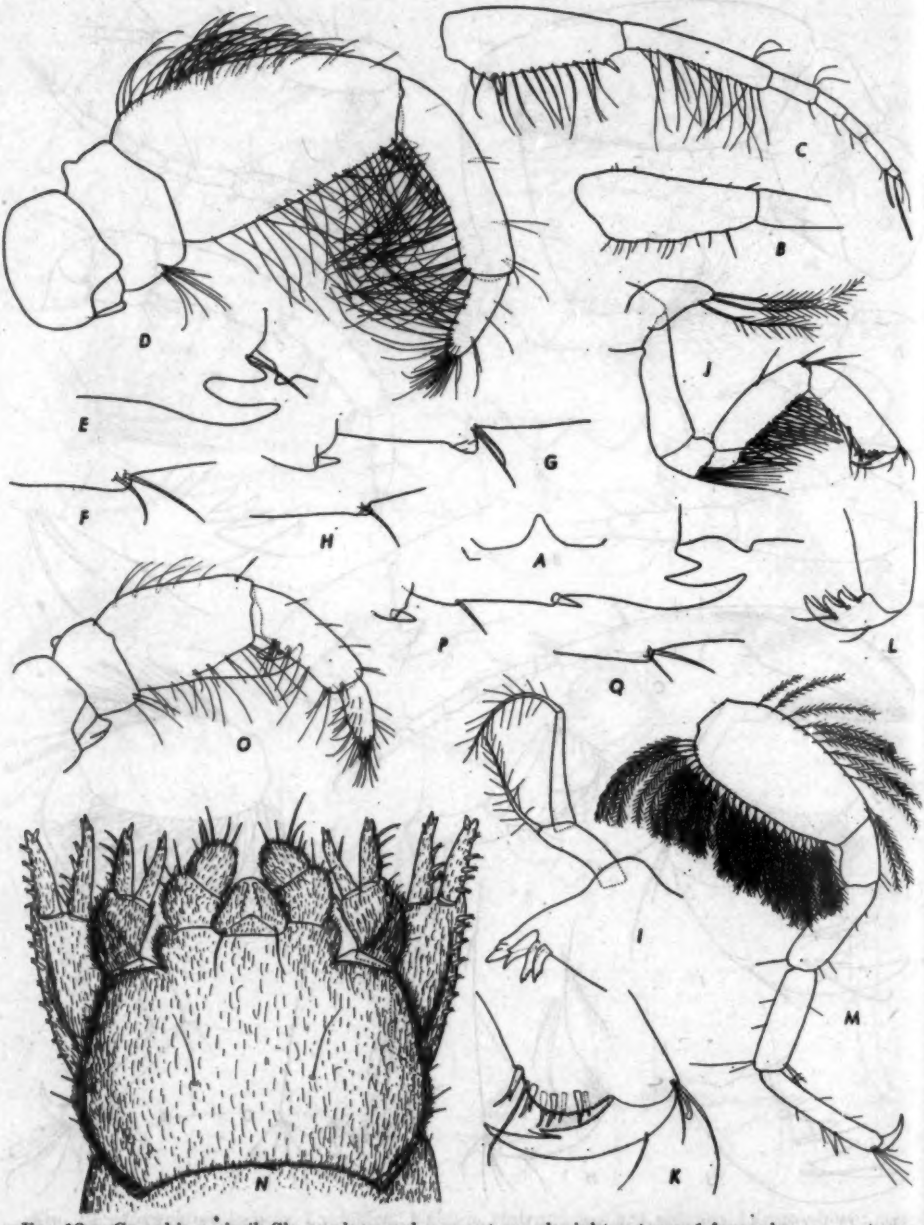


FIG. 12.—*Corophium simile* Shoemaker, male: *a*, rostrum; *b*, right antenna 1 from above; *c*, antenna 1, side view; *d*, antenna 2; *e*, antenna 2, specimen from May River, S. C.; *f*, *g*, *h*, tubercle on lower margin of fourth joint of antenna 2 of three different specimens; *i*, mandible; *j*, *k*, gnathopod 1; *l*, gnathopod 2; *m*, peraeopod 5; *n*, urosome and appendages; female: *o*, antenna 2; *p*, antenna 2 showing spine on lower margin of fourth joint of female from Vineyard Sound, Mass.; *q*, proximal tubercle on lower margin of fourth joint of a specimen from New Haven Harbor, Conn.

peake Bay to Winyah Bay, S. C. The National Museum has since received specimens from Haverstraw on the Hudson River, N. Y. (taken by H. K. Townes); Fort Raleigh, Roanoke Island, N. C.; Cooper River and Alligator Creek, S. C.; and Welaka, Fla. (taken by the U. S. Bureau of Fisheries). In Europe this species has been recorded from the coasts of Germany, Finland, Holland, France, and England.

C. lacustre extends up the rivers of the east coast of the United States into waters that are very nearly fresh.

Corophium louisianum Shoemaker

Fig. 11

Corophium louisianum Shoemaker, Proc. Biol. Soc. Washington 47: 30. 1934.

Corophium louisianum Crawford, Journ. Marine Biol. Assoc. 21 (2): 626. 1937.

When this species was described in 1934 there were only two known specimens, both males, one from Chef Menteur, La., and one from Biloxi, Miss. During the summer of 1944 M. W. Williams obtained for the National Museum mature specimens of both sexes at Biloxi, Miss., and at Sarasota Bay, Fla. *C. louisianum* is a tube-building species.

In describing the second antenna of the male (1934, p. 30), I said, "Fourth joint large and powerful, lower distal corner produced into a strong, slightly curved tooth, above which on the inside of the joint is a prominent distal lobe bearing a notch and setule." While this description is correct for the type specimen, most of the fully developed males possess a small tooth below this notch, as shown by Fig. 11, *f*. I also stated in the original description that pleon segments 4–6 were coalesced with their united lateral margins raised into a ridge above the dorsal surface. I should have said that the united lateral margins of the fourth and fifth segments are raised into a ridge above the dorsal surface. This ridge is very prominent in both sexes and does not show any interruption between the fourth and fifth segments. This correction also applies to pleon segments 4–6 of *Corophium simile*, which I described in the same paper.

The inner margin of the seventh joint of gnathopod 2 of the male bears two teeth, but occasionally there are three.

The female resembles the male except in the antennae. In the female the first joint of antenna 1 does not possess the protuberance on the upper inner margin or the forward-pointing tooth on the lower margin, but has only one proximal spine on inner margin and two small forward-pointing spines on the lower margin. In antenna 2 the second joint is produced below into a curved lobe bearing a small spine; the third joint bears a short anterior lobe armed with a short spine; the fourth joint bears on the lower margin a distal spine and another spine a little forward of the center; the fifth joint is without spines. The palm of gnathopod 1 is convex and passes by an evenly rounding curve into the hind margin of the joint, and it is armed on the outside and inside by a row of notched spines; the seventh joint bears distally on the inner margin a single forward-pointing tooth. In gnathopod 2 the seventh joint is armed on the inner margin with 2 teeth. Female measures from apex of rostrum to end of uropods from 4 to 4.5 mm.

Corophium simile Shoemaker

Fig. 12

Corophium simile Shoemaker, Proc. Biol. Soc. Washington 47: 28. 1934.

Corophium simile Crawford, Journ. Marine Biol. Assoc. 21 (2): 626. 1937.

In 1934 the range of *C. simile* was given as extending from Vineyard Sound, Mass., to South Carolina. Since then specimens have been taken at Lemon Bay, Fla., by Olga Hartman; at Sarasota Bay, Fla., by M. W. Williams; and at Apalachicola Bay, Fla., by A. S. Pearse. Though this species has a rather wide distribution, it appears to occur in very sparing numbers. It has not been recorded except from the east coast of the United States.

ENTOMOLOGY.—*The orchid bugs of the genus* Tenthecoris *Scott (Hemiptera: Miridae).*[1] TSAI-YU HSIAO, Nankai University, Tientsin, China, and REECE I. SAILER, U. S. Bureau of Entomology and Plant Quarantine. (Communicated by PAUL W. OMAN.)

For many years plant quarantine inspectors at the various United States ports have been intercepting large numbers of plant bugs of the family Miridae on Orchidaceae imported from Neotropical areas. Because of the absence of any comprehensive work treating the group of species involved, the identification of this intercepted material has been extremely inaccurate. This paper has been written in an effort to improve this situation and to provide names for several species not before described.

The genus *Tenthecoris* was established in 1886 by Scott (*8*, pp. 64–66). Previously, in 1860, Stål (*9*, pp. 57–58) had established the genus *Eccritotarsus* and included 15 species from Rio de Janeiro. This was found by Reuter and Bergroth to be a composite genus, and subsequently all the species, with the exception of *E. semiluteus*, were transferred to other genera.[2] Meanwhile, the existence of *Eccritotarsus* undoubtedly delayed recognition of Scott's genus *Tenthecoris*.

The genus *Tenthecoris* contains colorful bugs of medium size. *T. bicolor* Scott, as the only originally included species, is the genotype. *Tenthecoris* may be separated from *Eccritotarsus* and other related genera by the following combination of characters: Pronotal collar incomplete; rostrum long, attaining or surpassing apex of posterior coxa, third and fourth segments very short, together distinctly shorter than one-half the length of second segment (except in *distinctus* and *balloui*, n. spp.); antennal segment II of moderate length, not twice as long as I.

The bicolorous combination of orange to yellow with black to caerulescent black seems characteristic of the genus. Judged from the material studied the color pattern for each species is remarkably stable. The male genitalia are conspicuous and provide valuable characters for distinguishing species.

The oldest named species now included in *Tenthecoris* is *generosus*, a Mexican species that was described by Stål (*10*, p. 323) as an *Eccritotarsus* in 1862. Distant described *E. vestitus* in 1884 from Guatemala (*2*, p. 284) and *E. exitiosus* in 1889 from Trinidad (*3*, p. 202). Both species belong to *Tenthecoris*. In 1902 Reuter (*5*, p. 157) described *E. orchidearum* from Brazil and noted its similarity to *E. vestitus* and *E. exitiosus* of Distant without mentioning the genus *Tenthecoris*. Distant (*4*, p. 202) was the first to recognize *Tenthecoris* when in 1904 he published the following statement: "*Tenthecoris*, Scott is very closely allied to *Eccritotarsus*, Stål. It is described as an orchid pest, as is also *Eccritotarsus exitiosus* Distant and *E. orchidearum* Reuter. *T. bicolor* is very closely allied by description to Reuter's species."

In 1907 Reuter (*6*, p. 253) appears to have first become aware of the identity of *Tenthecoris bicolor*. At this time he synonymized *E. orchidearum* (synonymy is question in discussion for *T. bicolor*, p. 70) with *T. bicolor* and transferred *E. generosus* Stål (*7*, p. 154) to *Tenthecoris*.

In 1942 Costa Lima (*1*, p. 100) published a review of the literature pertaining to *T. bicolor* and provided illustrations suitable for its identification. As noted above, Distant had remarked that *exitiosus* was "very closely allied by description"; however, Costa Lima was the first to use the combination *Tenthecoris exitiosus*.

Thus it is seen that prior to the present paper *Tenthecoris* contained three species, viz., *bicolor* Scott, *exitiosus* (Distant), and *generosus* (Stål). One additional species, *Eccritotarsus vestitus* Distant is here transferred for the first time to *Tenthecoris*. Seven additional species, which we believe to be new, have been found in the collection of

[1] Received November 18, 1946.

[2] In a paper by the senior author (Proc. Ent. Soc. Washington 49(2): 59–62. 1947) it is pointed out, however, that seven of Stål's original species must remain in *Eccritotarsus*.

Neotropical Miridae in the United States National Museum. These new species are described below. It is regretted that the locality data on many of the specimens are incomplete. In all instances the data are believed to be accurate so far as they are available; however, it is seldom that more than the country is provided. This study is primarily based on material intercepted in quarantine and, while the locality data in many cases are of necessity general, host data are usually complete.

Tenthecoris confusus, n. sp.
Figs. 5, 19

Male.—Body ovate, length 4.6 mm, width 2.19 mm, reddish, with antennae, tibiae, scutellum, and inner half of hemelytra dark (dark area on dorsum with bluish luster), clothed densely with short simple flavous pubescence.

Head subvertical, width across eyes 1.12 mm, length seen from above 0.39 mm, height seen from side 0.9 mm; vertex somewhat flat, width 0.69 mm, frons slightly convex, clypeus moderately prominent, discrete from frons just below line drawn between the bases of antennae, apical one-third dark. Eyes not touching apex of pronotum, seen from side reniform, occupying nearly one-half the height of head. Rostrum length 1.75 mm, surpassing apex of posterior coxa, length of segments, I:II:III:IV::0.67 mm:0.73 mm:0.21 mm:0.13 mm, segment I thickest, II slenderer, compressed, III thicker than II, IV somewhat cone-formed.

Antennae dark, linear, inserted near apex of interior margin of eye, length of segments, I:II:III:IV::0.68 mm:0.85 mm:0.60 mm:0.7 mm, segment I gradually thickened toward apex, II linear, as thick as I at middle, III much slenderer than II, IV slenderer than III, extreme base of I, III and IV luteus.

Pronotum finely punctate, length 0.88 mm, width at base 1.59 mm, at apex 0.83 mm, apical margin slightly sinuate, lateral margin strongly impressed behind callus, posterior margin nearly straight or very slightly sinuate before scutellum, humeral angle broadly rounded. Scutellum triangular, with a large triangular depression at base, dark, extreme base reddish, length 0.56 mm, width at base 0.6 mm, mesoscutum reddish.

Hemelytra smooth, embolar margin convex, thickened, length 2.15 mm, corium with inner angle broadly dark, exterior margin of the dark area forming a straight line subparallel to emboliar margin, clavus dark (except basal one-fourth), cuneus declivent, length 0.86, width at base 0.73 mm, membrane dark, finely rugulose, apical margin luteus.

Gula, xyphus, anterior portion of propleura, metapleura, and posterior coxa tending to luteous. Legs comparatively short, length of posterior femur 1.51 mm, posterior tibia 1.72 mm, all tibiae dark, tarsi pale tending to fuscous at apex.

Male genitalia distinct, with a broad central portion, bearing a spinose process on left apical angle and a larger armlike process on right apical angle, the latter process turned abruptly downward at apical third; right paramere broad and long, with a tubercle at apical one-third, apex broadened, spoon-formed.

Female.—Similar to male in size and coloration, second antennal segment shorter than that in male. Body length 4.99 mm, width 2.32 mm; width of head across eyes 1.16 mm, width of vertex 0.65 mm; length of antennal segments, I:II::0.69 mm:0.86 mm (II and IV missing).

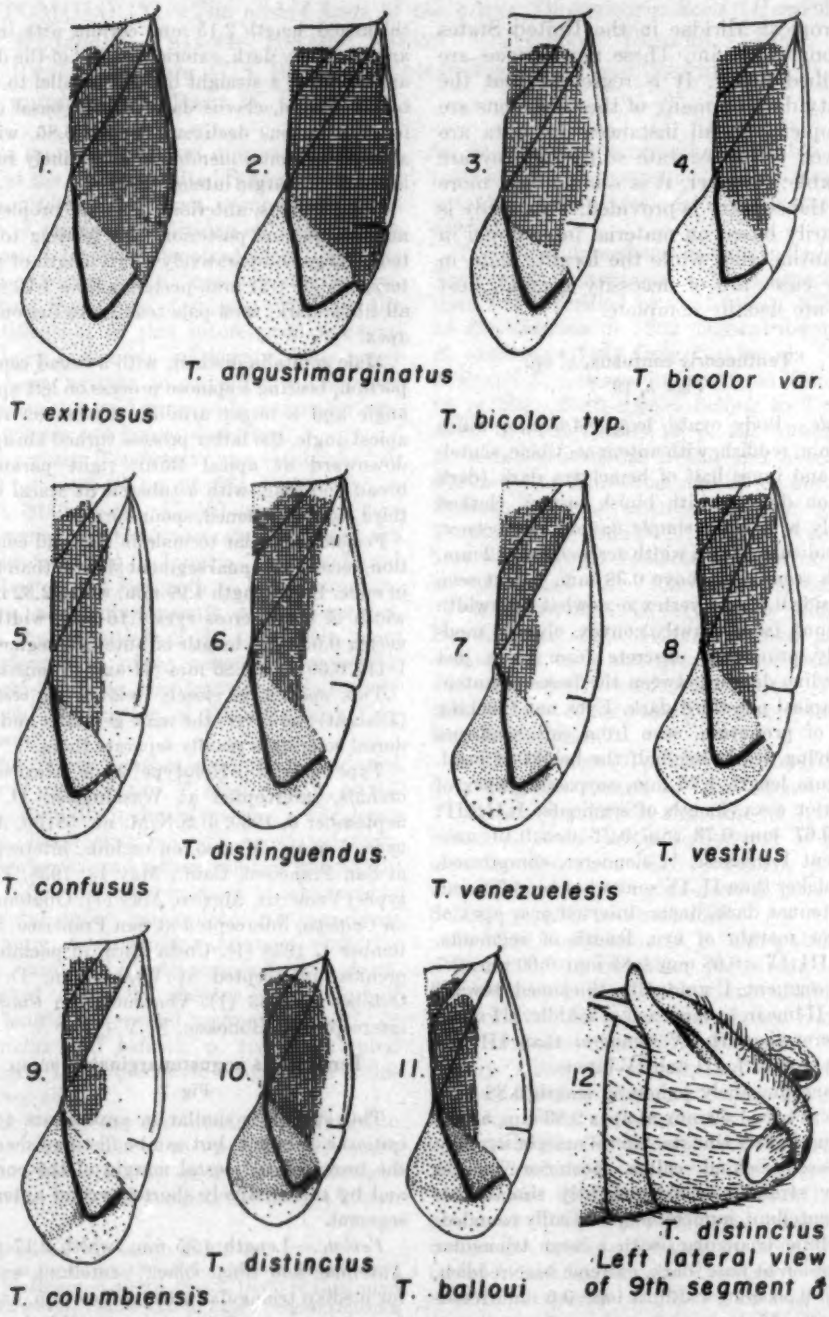
This species is closely related to *vestitus* (Distant); however, the male genitalia and the dorsal coloration readily separate them.

Type material.—Holotype: Male, Mexico, on orchids, intercepted at Washington, D. C., September 6, 1939, U.S.N.M. no. 58156. Allotype: Female, Mexico, on orchids, intercepted at San Francisco, Calif., May 13, 1938. Paratypes: Veracruz, Mexico, May (1). Guatemala, on *Cattleya*, intercepted at San Francisco, September 1, 1938 (1). Costa Rica, in packing of orchids, intercepted at Washington, D. C., October 4, 1933 (1). Venezuela, on *Cattleya*, intercepted at Hoboken, N. Y. (1).

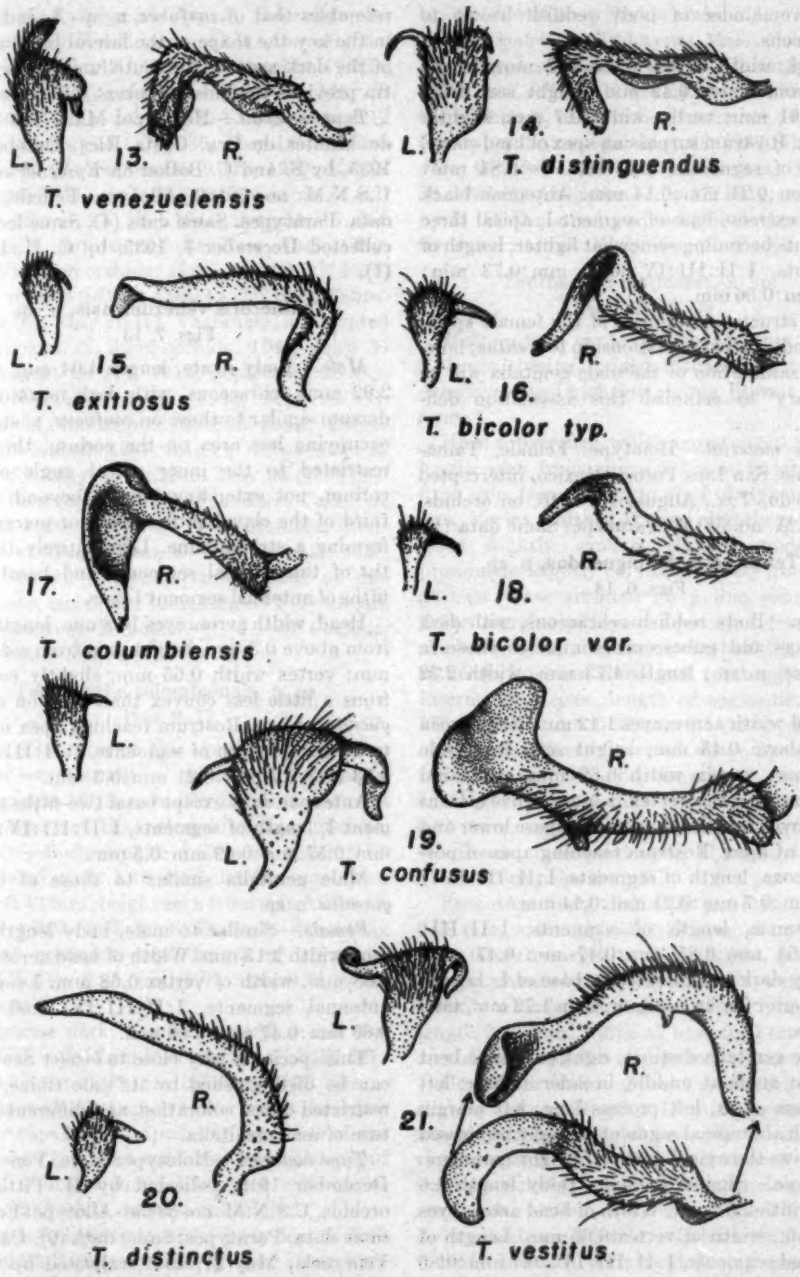
Tenthecoris angustimarginatus, n. sp.
Fig. 2

This species is similar in appearance to *T. exitiosus* (Distant) but can be distinguished by the brownish-red costal margin of the corium and by the relatively shorter second antennal segment.

Female.—Length 4.35 mm, width 2.17 mm. Antennae and tibiae black; scutellum, except for median triangular area, and corium, except for narrow margin along costa, black with violaceous reflections; membrane concolorous,



FIGS. 1–11.—Indications of the color pattern of the hemelytra and the scutellum in species of *Tenthecoris*. FIG. 12.—As indicated.



FIGS. 13–21.—Left (L) and right (R) parameres in species of *Tenthecoris*. In each case an outside view (relative to normal position on the ninth segment) is shown. In the case of Fig. 21 a lateral view of the right paramere is also shown.

dark; remainder of body reddish brown to ochraceous.

Head, width across eyes 1.12 mm, length seen from above 0.42 mm, height seen from side 0.91 mm; vertex width 0.7 mm, slightly convex. Rostrum surpassing apex of hind coxae, length of segments, I:II:III:IV::0.84 mm: 0.73 mm:0.21 mm:0.14 mm. Antennae black except extreme base of segment I, apical three segments becoming somewhat lighter; length of segments, I:II:III:IV::0.64 mm:0.73 mm: 0.49 mm:0.56 mm.

The structural affinities of the female specimens indicate close relationship to *vestitus;* however, examination of the male genitalia will be necessary to establish this association definitely.

Type material.—Holotype: Female, Tamazunchale, San Luis Potosí, Mexico, intercepted at Laredo, Tex., August 10, 1946, on orchids, U.S.N.M. no. 58157. Paratype: Same data (1).

Tenthecoris distinguendus, n. sp.
Figs. 6, 14

Male.—Body reddish ochraceous, with dark markings and pubescence similar to those in *confusus*, n. sp.; length 4.73 mm, width 2.32 mm.

Head width across eyes 1.12 mm, length seen from above 0.43 mm, height seen from side 0.86 mm; vertex width 0.69 mm, compared with *confusus* the vertex is more convex, frons less convex and the clypeus with base lower and darker at apex. Rostrum reaching apex of posterior coxa, length of segments, I:II:III:IV:: 0.77 mm:0.7 mm:0.21 mm:0.14 mm.

Antennae, length of segments, I:II:III: IV::0.65 mm:0.85 mm:0.47 mm:0.47 mm, entirely dark except extreme base of I. Length of posterior femur 1.51 mm, tibia 1.72 mm, tarsi fuscous.

Male genitalia distinct, right paramere bent at right angle at middle, broader at base, left paramere short, left process long; left margin of ninth abdominal segment strongly impressed to receive the apical portion of right paramere.

Female.—Similar to male. Body length 4.6 mm, width 2.37 mm. Width of head across eyes 1.19 mm, width of vertex 0.65 mm. Length of antennal segments, I:II:III:IV::0.7 mm:0.86 mm:0.56 mm:0.49 mm.

Structurally this species is closely related to *venezuelensis*, n. sp.; however, the color pattern resembles that of *confusus*, n. sp. As indicated in the key the shape of the lateral basal angles of the dark area on the scutellum and hemelytra provides the most apparent difference.

Type material.—Holotype: Male, San Pedro de Montes de Oca, Costa Rica, October 19, 1935, by S. and C. Ballou on *Epidendrum* sp., U.S.N.M. no. 58162. Allotype: Female, same data. Paratypes: Same data (4). Same locality, collected December 7, 1935, by C. H. Ballou (1).

Tenthecoris venezuelensis, n. sp.
Figs. 7, 13

Male.—Body ovate, length 4.04 mm, width 2.02 mm, ochraceous, with dark markings on dorsum similar to those on *confusus*, n. sp., but occupying less area on the corium, this area restricted to the inner apical angle of the corium, not extending basally beyond apical third of the claval suture; exterior margin not forming a straight line. Legs entirely (except tip of third tarsal segment) and basal two-fifths of antennal segment I pale.

Head, width across eyes 10.8 mm, length seen from above 0.3 mm, height seen from side 0.77 mm; vertex width 0.65 mm, slightly convex; frons a little less convex than that on *distinguendus*, n. sp. Rostrum reaching apex of posterior coxa, length of segments, I:II:III:IV:: 0.63 mm:0.7 mm:0.21 mm:0.3 mm.

Antennae dark except basal two-fifths of segment I, length of segments, I:II:III:IV::0.56 mm:0.57 mm:0.49 mm:0.5 mm.

Male genitalia similar to those of *distinguendus*, n. sp.

Female.—Similar to male, body length 4.39 mm, width 2.15 mm. Width of head across eyes 1.08 mm, width of vertex 0.68 mm. Length of antennal segments, I:II:III:IV::0.56 mm: 0.69 mm:0.47 mm:0.56 mm.

This species is very close to *bicolor* Scott but can be distinguished by its pale tibiae, more restricted dorsal coloration, and different structure of male genitalia.

Type material.—Holotype: Male, Venezuela, December 1918, collected by H. Pittier on orchids, U.S.N.M. no. 58158. Allotype: Female, same data. Paratypes: Same data (9). Caracas, Venezuela, May 27, 1941, collected by C. H. Ballou on *Cattleya labiada* (5). Caracas, Venezuela, intercepted at Washington, D. C., September 1933, on *Cattleya* plants (4). El Valle,

Venezuela, May 27, 1941, collected by C. H. Ballou on *Cattleya labiada* (1). Venezuela, intercepted at Washington, D. C., on orchids: 1933, December 8 (1); 1934, October 19 (2); 1936, June 19 (3), August 1 (6); 1937, May 28 (1), June 14 (1), July 7 (2), 15 (2), August 12 (1), November 14 (1); 1938, May 12 (2), June 12 (2), 16 (2), September 9 (2); 1939, May 2 (4), June 20 (1), July 26 (1), September 14 (1); 1940, March 25 (1); 1941, August 18 (1). Venezuela, intercepted at New York City, New York, on orchids: 1914, May 29 (1); 1915, February 2 (1); 1939, April 12 (2); 1940, February 13 (6), May 16 (1). Venezuela, intercepted at Hoboken, N. J.,on orchids: 1941, April 30 (2), August 18 (1); 1942, September 28 (1); 1943, November 4 (2); 1946, May 21 (1). Venezuela, intercepted at San Juan, Puerto Rico, on orchids: 1937, July 1 (1), November 12 (1); 1938, May 6 (1); 1940, May 20 (1). Venezuela, intercepted at San Francisco, Calif., on orchid: 1936, March 30 (1). Columbia, intercepted at Washington, D. C., on orchid: 1937, May 29 (2). Colombia, intercepted at San Francisco, on orchid: 1939, August 1 (1). Brazil, intercepted at Hoboken, N. J., on *Cattleya:* 1942, September 28 (2).

Tenthecoris colombiensis, n. sp.

Figs. 9, 17

The coloration of this species is similar to that of *venezuelensis*, n. sp., except that antennal segment III is pale. The antennal segment II is longer and the male genitalia are distinct.

Male.—Body length 4.52 mm, width 2.06 mm; head with 1.16 mm, length seen from above 0.43 mm, height seen from side 0.95 mm, vertex width 0.73 mm. Rostrum surpassing apex of posterior coxa, length of segments, I:II:III:IV::0.85 mm:0.94 mm:0.24 mm: 0.14 mm.

Antennae dark, base of segment I and segment III pale, length of segments, I:II:III: IV::0.59 mm:1.02 mm:0.71 mm:0.73 mm.

Male genitalia nearest *bicolor*, right paramere greatly expanded at apex, left paramere of the one-armed type also exhibited by *exitiosus* and *bicolor*. Ninth abdominal segment without tubercle at the left dorsolateral angle.

Female.—Similar to male, body length 5.16 mm, width 2.32 mm; width of head across eyes 1.2 mm, width of vertex 0.73 mm. Length of antennal segments, I:II:III:IV::0.6 mm:1.0 mm:0.68 mm:0.77 mm. Segment II not distinctly shorter than that of male.

Type material.—Holotype: Male, Colombia, intercepted at Washington, D. C., October 7, 1937, on *Cattleya*, U.S.N.M. no. 58159. Allotype: Female, same data, November 14, 1936. Paratypes: Same data, May 28, 1937 (4). Same data, October 1, 1937 (1). Same data, October 28, 1936 (1). Colombia, July 17, 1917, collected by H. E. Dietz from orchid (1). Colombia, intercepted at New York City, N. Y. (1).

Tenthecoris distinctus, n. sp.

Figs. 10, 12, 20

Male.—Body ovate, length 3.66 mm, width 1.85 mm, shining, reddish with dark on dorsum, densely clothed with fine, simple, flavous pubescence.

Head subvertical, width across eyes 0.80 mm, length seen from above 0.3 mm, height seen from side, from vertex to apex of clypeus, 0.86 mm. Vertex width 0.47 mm, slightly rounded, frons slightly convex, clypeus moderately prominent, slightly curvate, discrete from frons at base, base situated on a line connecting lower margins of eyes. Eyes seen from side reniform, occupying about one-half the height of head. Rostrum short, not reaching apex of intermediate coxa, length of segments, I:II: III:IV::0.17 mm:0.29 mm:0.14 mm:0.08 mm.

Antennae linear, inserted above apex of interior margin of eye, length of segments, I:II:III:IV::0.42 mm:0.53 mm:0.56 mm: 0.55 mm, segment I constricted at base, ochraceous, fuscous at apex, II black, III and IV dark but paler than II.

Pronotum finely distinctly punctate, length 0.98 mm, width at base 1.33 mm, at apex 0.56 mm, lateral margin nearly straight, posterior margin sinuate before scutellum, humeral angle broadly rounded. Scutellum black, triangular, length 0.47 mm, width at base 0.70 mm, with a median triangular impression at base.

Hemelytra with embolar margin thickened, slightly convex, length 1.72 mm; clavus black except extreme base; corium black with exterior margin broadly reddish, red area broadened posteriorly; cuneus triangular, length 0.6 mm, width at base 0.73 mm, cuneal fracture deep, membrane hyaline, cellular area black.

Body beneath with xyphus and propleura tending to flavous. Legs moderately long, anterior and intermediate tibiae, apex of posterior

tibia and all tarsi flavous; length of posterior femur 1.12 mm, posterior tibia 1.29 mm, anterior surface of posterior femur mottled with flavous spots.

Male genitalia very distinct, right paramere long, slender, and curved, fitting left dorsal margin of ninth abdominal segment which has a spinelike process at base, apex pointed; left paramere small, knoblike, of the one-armed type; arm not spinose.

Female.—Similar to male, body length 3.78 mm, width 2.02 mm. Length of antennal segments, I:II:III:IV::0.42 mm:0.6 mm:0.56 mm:0.53 mm.

This species is not altogether characteristic of the genus. Its body form, structure of head and pronotum, and bicolorous pattern undoubtedly place it as a member of *Tenthecoris;* however, its distinctly smaller size, considerably shorter rostrum of which the segments II and III taken together are longer than one-half the length of segment II and the distinctive male terminalia set *distinctus* apart from the other species. The long spinose process of the left dorsolateral angle of the ninth abdominal segment is suggestive of *Caulotops.*

Type material.—Holotype: Male, Guatemala, intercepted at San Francisco, Calif., March 1, 1944, on *Odontoglossum bictoniense,* U.S.N.M. no. 58160. Allotype: Female, same data, on *Odontoglossum grande.* Paratypes: Same data, on *O. bictoniense* (12). Same data, on *O. grande* (2). Same data, April 13, 1944, on *Oncidium leucochilum* (2). Guatemala, intercepted at Washington, D. C., on *Ocineta ocusa,* November 10, 1937 (1). Guatemala, intercepted at New York City, N. Y., on orchids, November 9, 1935 (1). Guatemala, intercepted at New Orleans, La., on orchids, January 30, 1941 (2). Guatemala, intercepted at New Orleans on *Primavera* log, February 3, 1941 (1). Guatemala, intercepted at Washington, D. C., on *Lycaste,* October 25, 1938 (1). Guatemala, intercepted at Honolulu, T. H., July 7, 1936 (2). Mexico, intercepted at Laredo, Tex., on orchids, October 30, 1941 (2). Tamazunchale, San Luis Potosí, Mexico, intercepted at Laredo, Tex., August 10, 1946, on orchid plants (5).

Tenthecoris balloui, n. sp.

Fig. 11

This species is similar to *T. distinctus,* n. sp., in its size and length of rostrum, but can be distinguished by the different color pattern. Dark area on corium occupying less than the inner half; the anterior margin of the dark area on hemelytra not forming a straight line. Basal dark annulation on antennal segment I more distinct. Clypeus more curvate, and apices of tarsi tending to fuscous.

Female.—Body, length 3.44 mm, width 1.98 mm. Head across eyes 0.86 mm, length, seen from above, 0.3 mm, height, seen from side, 1.08 mm; width of vertex 0.52 mm. Rostrum scarcely reaching middle of intermediate coxae, length 0.95 mm. Length of antennal segments, I:II::0.43 mm:0.65 mm (III and IV missing).

This species is named in honor of C. H. Ballou whose activities as a collector have aided greatly in increasing our knowledge of the Neotropical fauna.

Type material.—Holotype: Female, Medellin, Colombia, March 29, 1930, collected by S. and C. H. Ballou on *Cattleya gigas,* U.S.N.M. no. 58161. Paratypes: Same data (7).

Tenthecoris bicolor Scott

Figs. 3, 4, 16, 18

Tenthecoris bicolor Scott, Ent. Monthly Mag. 23: 64–66. 1886.

Judged from the source of specimens intercepted at various United States ports, this species is restricted to Brazil. The only specific locality from which *T. bicolor* has been received is Santos, São Paulo. All other specimens except one are recorded as "Brazil on cattleya." Most of these were intercepted at Hoboken.

There is considerable variation among the specimens of different series, but since the exact locality of origin is not known it is not possible to know if this variation is correlated with geographical distribution. The degree of variation may be seen by comparing Figs. 3 and 16 with 4 and 18. The former, from "Santos," represent the form accepted here as typical since it seems to agree most closely with Scott's original description; length 4.5 mm. The latter figures represent a slightly smaller and lighter form; length 4.0 mm. One specimen bears determination labels as follows: "Spec. typ. *Eccritotarsus orchidearum* Reut." and "*Tenthecoris bicolor* Scott O. M. Reuter det." This is a female specimen as large as the largest examples among the 33 specimens studied. The reddish margins of the hemelytra are wider and more discrete than

in the other specimens while the dark portion of the corium and clavus lacks the pronounced metallic blue reflection exhibited by typical form. The median line of the scutellum which is marked with reddish to the apex, is also unusual even for a teneral specimen. It seems very likely that this specimen represents a distinct species, in which case Reuter's name *orchidearum* will have to be restored. The final decision in this matter must wait study of male examples.

Type material.—Not seen. Should be in the British Museum (Natural History), London. Described from "specimens" taken alive in England "on leaves of an orchid from Bahia."

Tenthecoris vestitus (Distant), n. comb.
Figs. 8, 21

Eccritotarsus vestitus Distant, Biologia Centrali-Americana, Rhynchota, Hemipt.-Heteropt., 1: 284, pl. 28, fig. 2. 1884.

Twenty-five specimens of this species have been studied. Of these, 24 were intercepted on Orchidaceae originating in Guatemala. One specimen indicates Nicaragua as locality of origin. The interceptions were made at the ports of San Francisco, Calif., New York, N. Y., Hoboken, N. J., and Washington, D. C. Besides "on orchids," *Laelia superbiens* and *Oncidium* sp. have been reported as host plants.

The species shows considerable size variation, ranging from 3.75 mm to 5.10 mm within the same sex (♂).

Type material.—Not seen; should be located in the British Museum (Natural History), London. Described from "Guatemala, Pantaleon." Number of specimens not indicated.

Tenthecoris exitiosus (Distant)
Figs. 1, 15

Eccritotarsus exitiosus Distant, Ent. Monthly Mag. 25: 202. 1889.
Tenthecoris exitiosus, Costa Lima, Orquidea 4 (31): 100. 1942.

Fifty specimens of this species have been examined. With the exception of two specimens collected at Port of Spain, Trinidad, February 20, 1895, by T. J. Potter, on orchids, all bear labels indicating "Colombia" as country of origin. The specimens have been intercepted at the ports of Washington, D. C., San Francisco, Calif., and Hoboken, N. J., with the exception of two taken at "Medellin, Colombia," March 29, 1930, by S. and C. H. Ballou, on *Cattleya gigas*. Several of the intercepted specimens also bear labels indicating *Cattleya gigas* as a host plant. The remainder refer either to "*Cattleya* sp." or "orchids."

This is a strikingly distinct species having the hemelytra and corium, with the exception of a narrow basal area, black with metallic-blue reflections. Pronotum and head orange-red; apex of the hind femora, hind, middle, and apical fourth of fore tibiae black. Apical half of tylus black; two basal segments of antennae black, apical two white.

Length varies in specimens at hand from 3.75 mm to 4.9 mm.

Type material.—Not seen. Should be in the British Museum (Natural History), London. Described from "some specimens" originating in the "Botanical Gardens at Trinidad," where they were reported as doing much damage.

Tenthecoris generosus (Stål)

Eccritotarsus generosus Stål, Stettin Ent. Zeit. 7 (7–9): 323. 1862.
Tenthecoris generosus, Reuter, Zeitschr. Wiss. Insektenbiol. 3: 253. 1907.

No examples of this species have been studied. Stål's description indicates that the second antennal segment of this species is unusually long. Reuter also mentioned this structure, though it is not known that he saw Stål's type specimen. Distant's illustration of the type specimen (2, p. 284, tab. 22, fig. 24) indicates a superficial resemblance to *T. exitiosus*.

Type material.—Not seen. Should be in Naturhistoriska Riksmuseet, Stockholm. Described by Stål from one male specimen received from Mexico.

NOTE CONCERNING ILLUSTRATIONS

The accompanying figures of the hemelytra are intended to be accurate only so far as color pattern is concerned. These were drawn from the insect, and other details, to a considerable degree, depend upon the angle from which the wing was viewed. The claspers must also be considered as diagrammatic. In comparing claspers with these illustrations it is best to place the entire ninth segment of the abdomen in KOH until the muscle tissue is dissolved sufficiently to allow easy dissection. The claspers should then be placed in glycerin

and studied without a cover glass as it is necessary to move the parts about in order to view them in approximately the position figured.

KEY TO SPECIES

1. Rostrum scarcely reaching apices of intermediate coxae; smaller species (less than 4 mm. in length) 2
   Rostrum reaching or surpassing apices of posterior coxae; larger species (more than 4 mm in length) 3
2. Dark area of corium throughout two-thirds of its length equal to or exceeding width of clavus ..... *distinctus*, n. sp.
   Dark area of corium equaling width of clavus only at apex of clavus ..... *balloui*, n. sp.
3. Hemelytra entirely dark (except the extreme base) 4
   Hemelytra with lateral margin reddish or ochraceous 5
4. Antennal segment II about twice as long as I. *generosus* (Stål)
   Antennal segment II much less than twice the length of I ..... *exitiosus* (Distant)
5. Tibiae dark or with dark markings 6
   Tibiae without dark markings 8
6. Pale margin of hemelytra with greatest width usually less, never more than length of cuneal fracture (see Figs. 3 and 4) 7
   Pale margin of hemelytra with greatest width exceeding length of cuneal fracture (see Figs. 5, 3, and 8) 8
7. Cuneus dark except for extreme lateral margin ..... *angustimarginatus*, n. sp.
   Cuneus yellowish red to reddish .. *bicolor* Scott
8. Dark area on corium occupying much less than inner half of corium; pale portion of corium with sides almost parallel or gradually narrowed toward base; clypeus distinctly fuscous 9
   Dark area on corium occupying nearly inner half of corium; pale portion of corium noticeably narrowed along basal third; clypeus not distinctly fuscous.
   vestitus (Distant), n. comb.
9. Basal margin of dark area on scutellum and clavus nearly on a straight line; basal margin of dark area on clavus and lateral margin of dark area on corium forming approximately a right angle.
   distinguendus, n. sp.
   Basal margin of dark area on clavus distinctly distad to that on scutellum, and forming, with lateral margin of dark area on corium, an obtuse angle of approximately 135°.
   confusus, n. sp.
10. Antennal segment II longer than width of vertex plus an eye; segment III distinctly paler than IV ..... *colombiensis*, n. sp.
    Antennal segment II shorter than width of vertex plus an eye; segment III not distinctly paler than IV ... *venezuelensis*, n. sp.

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